15 MAR 1906

ANY NUMBER SENT FREE BY BOOK POST
to those remitting 2s. in advance.

THE JOURNAL OF INDIAN ART AND INDUSTRY

PRICE TWO SHILLINGS.
Vol. X.
JANUARY, 1903] [No. 81.

CONTENTS.

SILK FABRICS OF THE BOMBAY PRESIDENCY
BY S. M. EDWARDES, I.C.S.
Winding and Spinning Silk.
Doubling and Warping.
Part of Heddle and Shuttle.
Weaving in an Upper Storey.

SILK FABRICS OF THE CENTRAL PROVINCES.
BY F. DEWAR, I.C.S.
Woman reeling Tasar Cocoons, &c.
The Laying of the Warp. The Loom.
Spinning Implements.

SILK INDUSTRY IN THE PUNJAB.
BY W. M. HAILEY, C.S.
Three Plates of Implements.

INDEX TO VOLUME V.
BY IVIE HAMILTON.

E. 13604
GA. 65530
2013

RAM SINGH DEL. MAYO SCHOOL OF ART, LAHORE.

Published under the patronage of the Government of India.
PHOTOGRAPHED, PRINTED, AND PUBLISHED BY W. GRIGGS, ELM HOUSE, HANOVER STREET, PECKHAM, LONDON.
LONDON AGENT—BERNARD QUARITCH, 15, PICCADILLY, W

IRON WORK.

From Objects and Drawings in the South Kensington Museum.

In 28 Parts, price 28/-.

LIST OF PLATES.

ENGLISH.

Plate 1. Details of wrought iron Grille, known as the St. Swithin Grille, in Winchester Cathedral.

,, 2. Wrought iron Grille in the Chapel of St. Anselm, Canterbury Cathedral.

,, 3. Wrought iron Screen at entrance to Henry V.'s Chantry in Westminster Abbey.

,, 4. Details of wrought iron work in Canterbury Cath.

,, 5. Details of wrought iron work in Winchester Cath.

,, 6. Wrought iron Screen from St. John's Church, Frome, Somersetshire.

,, 7. Wrought iron Panel and Gate in Winchester Cath.

,, 8. Wrought iron Screen in the Chapel of University College, Oxford.
Wrought iron Altar Rail in St. Philip's Church, Birmingham.
Wrought iron Bracket in Denyer Street, Chelsea.

,, 9. Wrought iron Balusters.

,, 10. Pair of wrought iron Mace Stands.

,, 11. Steel Rim Lock, in pierced and engraved brass case.

,, 12. Steel Lock in pierced brass case.

,, 13. Steel Lock in pierced and engraved brass case.
Steel Key.

,, 14. Steel Hinge, covered with pierced and engraved brass.

FRENCH.

,, 15. Oak Coffer, decorated with wrought iron scrollwork.

,, 16. Wrought and stamped iron Hinge for a coffer.
Wrought and stamped iron Hinge.

,, 17. Wrought iron Knockers.

,, 18. Wrought iron Knockers.

,, 19. Wrought iron Lock

,, 20. Wrought iron Grille (*Guichet*).

,, 21. Two wrought iron Candelabra.

,, 22. Two wrought iron Candelabra.

,, 23. Engraved steel Lock and Key.

,, 24. Wrought iron Door, painted and gilt.

,, 25. Two wrought iron Panels.

,, 26. Wrought iron Bracket.

FLEMISH.

Plate 27. Wrought iron Balcony.

GERMAN.

,, 28. Wrought iron splayed Lock for a Coffer.

,, 29. Wrought iron splayed Lock for a Coffer.

,, 30. Wrought iron Lock and Hasp.
Wrought iron Door Handle.

,, 31. Wrought iron Lock and Hasp.
Wrought iron Door Handle.

,, 32. Wrought iron Door Handles.

,, 33. Wrought iron Door Hinges.

,, 34. Oak Window Shutter, with wrought iron mountings

,, 35. Wrought iron Lock and Key.

,, 36. Wrought iron Bracket with bell.

,, 37. Wrought iron Grating for a fanlight.

,, 38. Pair of wrought iron Gates.

,, 39. Wrought iron Bracket and Sign.

,, 40. Wrought iron Hook for a Candelabrum.
Wrought iron Candelabrum.

,, 41. Two Wrought iron Window Gratings.

,, 42. Wrought iron Window Grating.

,, 43. Wrought iron Coffer.

,, 44. Top of wrought iron Coffer.

,, 45. Wrought iron Bracket.

ITALIAN.

,, 46. Pair of wrought iron Gates.

,, 47. Two wrought iron Panels.
Wrought iron Grille.

,, 48. Wrought iron Bowl Stand.
Two wrought steel Bowl Stands.

,, 49. Wrought iron Panel.

,, 50. Pair of wrought iron Gates.

,, 51. Pair of wrought iron Gates.

SPANISH.

,, 52. Wrought iron Knockers.

,, 53. Wrought iron Knocker.

W. GRIGGS,
Hanover Street, Peckham,
London, S.E.

The Journal of Indian Art and Industry.

SILK FABRICS OF THE BOMBAY PRESIDENCY.

By S. M. EDWARDES, Esq., I.C.S., Assistant Collector, Bombay.

"Most writers on silk," remarks the author of an article in the *Textile Journal*, "fix the home of the domesticated worm to be China, whereas a few have adduced arguments to prove an Indian origin for the worm. Among the latter is Mr. Mookerji, who, in an extensive report upon the subject, claims that the ancient literature of the Hindus and the Sanskit language afford valuable historical arguments in support of this thesis." A Sanskrit scholar of Bombay, however, informs us that silk is not mentioned at all in the oldest Vedic works, and that wherever mention is therein made of cloth, cotton and wool form the basis of the fabric. Further, that the word *Chin-ánshuka*, which is once or twice used in later works to denote silken fabrics, points to the fact that China was the original home of both the silkworm and the fabric, which probably were unknown in India until the post-Buddhistic age. Any discussion or attempt to decide the merits of these rival claims must perforce lie beyond the limits of this treatise, which concerns itself rather with the condition of the silk industry in Bombay at the opening of this twentieth century. But one may remark, in passing, that references to silk become gradually more numerous in the post-Christian eras, and that the terms employed by writers of those times to denote silk or fabrics of silk show that they were conversant with the origin of the thread, that is to say, with its birth from the worm.

Interesting though the matter is, one must perforce turn from the historical evidence regarding silk, to the question of sericulture in the present day. In many parts of the world the industry thrives; but to the Bombay Presidency the silk-worm is to-day a complete stranger. In no district is the cultivation of silk from the worm now practised; though attempts in this direction have been made in past years.

In 1827 a small mulberry-garden was opened at Dhulia, under the direction of Mr. Giberne, the Collector of Khándesh; and was visited ten years later by Signor Mutti, who reported that, considering the ignorance of those employed in tending the worms and in looking generally after the garden, the silk produced was good and would fetch about ₨13 per pound. With this assurance and with the intention of as far as possible aiding Mr. Giberne's work, the Bombay Government indented upon Bengal for five convict families skilled in the management of silk-worms and the winding of silk. The convicts were despatched, but travelled no further than Poona, as the experiments then being conducted in that city augured of greater success. Time passed and witnessed the departure of Mr. Giberne, and the sale of the garden to a native trader, by whom it was allowed to run waste. Others who succeeded Mr. Giberne in the control of the district, had it in mind to re-commence the experiment, but found no opportunity to carry matters to a practical issue.

Signor Mutti commenced the culture of silk-worms in the Kothrud and Dhamdere gardens at Poona in 1829, and was able eight years afterwards to report that his silk had been valued at from 23*s.* to 29*s.* a pound in London, Glasgow, and Manchester. The five convict families aided him, and to such good purpose that others, both European and native, were induced by the sight of his success to set up rival gardens. Thus matters remained until the year 1840, when the guiding-spirit of the enterprise fell ill, and abandoned his duties. Thereafter, doubts as to the permanent success of sericulture in the Deccan began to prevail, and culminated in 1847 in an order from the Government of Bombay to close all operations. The mantle of Signor Mutti fell upon a Major Coussmaker, who from 1875 to 1882 strove, by every device in his power, to reconcile the silk-worm to a domesticated life, and to overcome the natural perils of damp and drought, so fatal to his operations.

Of other attempts at sericulture, that made in Kaira during the early years of the nineteenth century, and another during the seventies at the Dhárwár Jail, deserve brief notice. The Dhárwár experiments, under the guidance of Dr. Mackenzie, met with fair success and continued until 1876. In Kaira, however, the work languished, by reason of the lack of interest shown by the native, and was brought to a sudden close by the excessive heat of the year 1843, which killed all the worms. Sericulture is now non-existent in Bombay, which is thus forced to depend upon China and Bengal for a supply of silk.

The Raw Silk.—Since, then, raw silk is produced in no part of this Presidency, whence does it come, and in what condition does it reach the hands of the weaver? Excluding the case of the Silk Mills, which will be noticed hereafter, there appear to be four places from which the raw material is distributed, usually *viâ* Bombay, to the various centres of the hand-weaving industry. They are China, Bengal, Persia, and Bangalore. But the variety, and the condition in which it is imported into up-country towns, differs according to locality.

Of the real China silk, the following five varieties find their way into the Bombay market:—Superior China, costing Rs.20 per lb; Lankin, Rs.18; Kayyam, Rs.16; Mayya, Rs.14; Panjam (very inferior), Rs.8 or Rs.12. All these kinds are imported in the raw thread state direct from China by the Chinese and Khoja merchants of the city, and are unbleached and undyed. A very small quantity, ready bleached, is also annually brought to Bombay. Such of it as remains in Bombay is sold to Multanis and Bohoras residing in Thossa Moholla and Bhoiváda, and by them to the local loom-owners, who favour the best quality for the warp and other qualities for the woof. The rest, which finds its way to out-stations, is occasionally bleached and dyed in Bombay, but more often travels in the condition in which it arrived. Coming to the Central Division of the Presidency, it appears that Yeola obtains Chinese silk of various qualities from Bombay, commencing with the very best quality at ₨20 or more per lb., and passing on through many kinds known as Charám, Sot, Salbaphi, and Sim, which cost from Rs.8 to Rs.16 per lb., to the inferior Panjam priced at Rs.$2\frac{1}{2}$ per ser. A small quantity of dyed silk thread also is imported into the town of Násik. The import into Poona consists of hanks of three varieties, of which

"Lankin" thread is the most noteworthy, and which, after arrival from Bombay, have to be locally prepared for the loom. Three places only in the Northern Division import Chinese silk, namely, Thána, Surat, and Ahmedabad. Of these, Thána uses but a small quantity, though of the superior kinds. But Surat and Ahmedabad order very large quantities of every variety of silk thread from the merchants of Bombay. A few well-to-do persons obtain the material direct from China, and have no dealings with the trading community of Bombay. The silk is imported in hanks, which are subjected on arrival to the ordinary spinning and reeling, and is known by a variety of names, denoting its several qualities. Both places are also reported to import the material bleached, spun, and dyed. Regarding Sind, most of the silk used in Hyderabad, Tatta, and other places, comes from Bombay, is of superior quality, and is locally reeled, spun, and dyed. Hyderabad, however, claims to occasionally obtain ready bleached and spun Chinese silk.

The raw material of Bengal holds the second place, in respect of the quantity used in this Presidency. Usually it reaches the local trader by rail from Calcutta, passing *en route* through Bombay. Like the silk of China, it consists of more than one variety, according to the class of worm from which it springs. Bengal silk is invariably of a deep yellow hue, and hence is known throughout the Southern Division of the Presidency as *Bhangar gundu, i.e.* "golden ball." Like the white silk from China, it arrives in hanks of thread, roughly spun, but not sufficiently strong to admit of its being used at once in the loom. The Bijápur district is supplied with this class of silk by the trader of Bágalkot, who, after import, either has it locally bleached and thrown, or distributes it in its unfinished state to the small traders of the villages. It is similarly imported in considerable quantities *viâ* Bombay into Belgaum and Dhárwár. The former of these two districts also imports raw hanks direct from Murshidabad, and performs the bleaching and dyeing processes within its own limits; inasmuch as the procedure formerly followed of buying it dyed from Poona and Bombay was found to be unduly expensive. In the Central Division, Sholápur and Sátára obtain it from Calcutta and other places in the North-West Provinces, and prefer it, by the reason of its cheapness, to the silk of Hongkong; while Násik, Poona, and Ahmednagar are also partial to its use, importing it partly direct from Calcutta and partly through merchants in Bombay. Sind has it brought direct from Bombay, as a general rule; though, in the case of Tatta, a certain quantity is delivered by a more direct route from Mooltan.

Silk, denoted by the name "Laddu" and imported from Bangalore, is used only by the weavers of the Southern Division of the Presidency. Being of inferior quality, the amount imported is, even in Belgaum and Dhárwár, not large; while more remote centres of the industry could hardly be expected to go to the expense of importing it from the Southern Presidency. The only places which consume Persia silk appear to be Poona and Násik; they receive it in small quantities from Bombay, whither it is brought from Muscat. Its quality should be superior, as it is the product of the "Bombyx Mori," and is said to be capable of being easily reeled. A good deal of the silk used in Sind is said to come from Bokhara and Kabul; and local report mentions a curious method of hatching the eggs of the silk-worm moth in Afghanistan, by tying them up for five or six days in the hollow of the arm-pit. As soon as the worm appears, it is transferred to mulberry trees, which are covered with thin gauze or muslin cloths to prevent its crawling away.

Sorting, Reeling, and Spinning.—The raw silk, as was mentioned above, arrives in hanks of thread, which is not sufficiently strong to bear the tension of the loom. The fundamental object, therefore, of the first process in the preparation of silk is the strengthening of the thread for the warp. The woof-threads, as a rule, undergo a less intricate process of preparation. In Surat it consists merely of winding the threads from two or more bamboo frames, according to the thickness required, on to a "parta" or reel, and thence on to small bobbins. The silk used in the woof is coarse and of the quality from which tassels and strings are made. In the preparation of silk for the warp, the following five instruments or appliances are used:—(1) A large cage made of string and bamboo; (2) a conical reel of split bamboo; (3) reed bobbins; (4) one small wheel or "roda"; (5) the throwing-machine or "rahat," which includes a large wheel called "charka," a bobbin-frame, two sets of glass bangles, and a long drum or roller of wood. The bamboo cage is first called into play. The sorter opens the hank of raw thread and places it round the cords of the cage, and then fixes the cage in such a way that it will, when impelled by the toes, revolve with its axis vertical. The sorter, who may be either a man or a woman, then sits down with five or six of the conical reels at his side. As the quality of the fibres in one hank are numerous, the sorter's chief duty is to watch the gradations of the thread, as it leaves the cage, and wind all silk of each variety round a separate reel. He next finds the end of the raw hank, knots it to the spoke of one of the reels, and with his foot starts to turn the bamboo cage; at the same time he with one hand twists the reel. The fibre passes off the cage, through the fingers of his other hand, and on to the reel. As soon as he feels the quality of the silk change, he breaks the thread, picks up a second reel, knots the end of the thread to it, and again winds on, until the quality changes a second time, when a third reel or the first again, as the case may be, is taken up. If the new quality is similar to that on the first reel, the two ends of silk are put into the mouth and tied by the tongue in an extremely neat and speedy manner. The reason why this operation is performed by the tongue, and not by the fingers, is that the silk is liable to cut the skin of the fingers, whereas the moisture of the tongue softens and prevents it from causing an incision. In this way, even a youthful worker will, without hitch or mistake, sort the hank over five reels. The silk is now ready for spinning; and the small wheel and bobbins are called into play. The wheel is supported on either side of the axle by uprights, fixed in a flat wooden stand, at the other end of which are two smaller uprights, supporting a steel spindle, which projects a few inches at the side. A cord passes round the wheel and spindle. The spinner first places one of the hollow reed bobbins upon the projecting part of the spindle, and ties to it the end of the silk which is upon the reel. Then, holding the reel in one hand, he turns the wheel with the other. The silk thread, which has already been connected with the bobbin, slowly winds off the reel and on to the bobbin. This process is continued until all the bobbins required have been loaded with thread.

The last process is the most intricate of all, and consists in transferring the thread from the bobbins on to the circular drum. The machine used is in three parts; firstly, a large wheel turned by hand, secondly the bobbin

frame, and thirdly the drum. The bobbin frame consists of an upright central bar or bars and two upright side pieces. The central bar is furnished on either side with a row of iron or wooden spindles, on to which the reed bobbins slide; and each of the side bars has a row of glass bangles, in number corresponding to the number of spindles. Each bangle is fixed directly opposite to its respective spindle. To impart a circular motion to the spindles, they are each connected by a cord with the big wheel, the cord in each case passing round the wheel and the inner end of the spindle. The whole frame is about five feet high, and rests during the process in a slanting position; the bottom part being on the ground, and the top part supported by upright posts fixed in the ground in front of the wheel. In front of the bobbin frame with its spindles and bangles are two upright posts, between which is supported a round roller or drum, about 6 or 8 feet long and 2 feet in diameter. It is made to revolve by a strap or cord passing over its centre and round the axle of the big wheel. Halfway down the posts, and likewise fixed horizontally between them, is a rod set with a number of glass bangles. It should be specially noted that the number of bangles upon this rod are exactly half the aggregate number of bangles fixed upon both sides of the bobbin frame. In other words, if each side of the frame contains 16 bangles, and the whole frame 32 bangles in all and 32 bobbins, then the bangles upon the horizontal rod number 16. To explain the process more clearly, we will concern ourselves with two spindles only—that is to say, with the top spindles upon either side of the central bar of the frame. On to each of these the workman places a bobbin; these two bobbins contain thread of similar quality. The thread from each is passed through its respective bangle, the two threads remaining separate until they reach the horizontal rod. There they are united, and pass together through one bangle in the series upon the rod. The twofold single thread then passes upwards on to the drum, to which it is secured. The bangles upon the rod are so placed that a twist is given to the threads as they pass through, and causes them to unite more closely into one double thread. Thus, when the workman starts the big wheel moving, the cords which pass round it put each set of two spindles in motion; each pair of bobbins revolve and send their threads separately through two bangles upon the frame; each pair of threads pass onward to the horizontal rod, where the divided pair become one, and are slowly rolled round the drum. In other words, supposing there are 16 bangles on either side of the frame, one sees 32 threads pass upward to the horizontal bar. These two threads are twisted into one, and 16 twofold threads pass upwards to the drum. At the end of the process, therefore, there are upon the drum 16 separate rolls of silk, at equal distances from one another, and the thread of which each roll consists is "dontar," or double thread. A slightly different process, productive of the same results, is followed in Surat.

Bleaching and Dyeing.—The silk, now reeled and spun, is well-nigh ready for the dye-vat. But, that each step in the gradual evolution of the raw material may receive notice, it is desirable to subdivide the next process into four distinct stages, namely Bleaching, Mordanting, Dyeing, and Sizing.

Bleaching.—To whiten the silk and clear it of impurities, it is immersed in a solution known as "Ukhar"; of impure carbonate of soda, or of this material and slaked lime. Impure carbonate of soda is of three kinds, known as *papadkhar*, *kelikhar*, and *khárimáti*; the first-named, however, is the most commonly used. Assuming the weight of silk to approximate to 80 tolas, a solution of 20 tolas of *papadkhar* and 30 lbs. of water is made, some 15 or 20 tolas of native soap or soda being sometimes added thereto. The whole solution is set to boil in a large vat. As soon as the first effervescence appears, two men dip the silk (which is still damp from immersion in cold water) into the boiling solution. The dipping is effected by means of two wooden sticks, about the size of a pestle, upon which the skein or hank is suspended. The workers, one of whom stands on either side of the vat, grasp the ends of the sticks and lower the silk four times into the bleaching mixture. Then, moving the sticks round to the immersed portion of the skein, they likewise dip the remaining portion four times. The whole circumference of the skein is in this way subjected to immersion, and the silk is rid of all dirt and gum. When drawn tight upon the sticks, it emits a grating sound, from which an experienced bleacher can always decide whether the silk has been sufficiently soaked. Once fully bleached, the silk is cooled by immersion in cold water and finally dried, partly by wringing it in the hands, partly by striking it against a flat slab of stone.

Such being the process in regard to silk that has to pass through the hands of the dyer, it only remains to note the procedure in the case of silk which is to be used white or undyed. The boiling solution of *papadkhar* is generally employed; but, occasionally, a simple washing with country soap is considered sufficient. Country soap is manufactured from the oil of the Bassia latifolia, boiled in an alkaline lye of khar and lime, and costs about $1\frac{1}{3}$ annas per lb. After washing, the white silk is subjected to fumigation. A large bamboo basket is turned upside down, and underneath is placed a vessel containing burning sulphur. Upon the upturned bottom of the basket the silk is spread out and covered with cloths. The sides of the basket are likewise covered to prevent the entrance of air and the escape of the fumes. In this condition the silk remains for some fifteen minutes and is then ready for use in the loom.

Mordanting.—This is the second stage through which silk has to pass before being dyed, but is never followed if the silk is to remain white. The process, as followed in the Southern Division of the Presidency, is thus described. Some three to five tolas of alum are dissolved by gentle heat in 15 lbs. of water. The bleached thread is steeped in this solution for one night, and then washed four or five times in clear water. The length of time during which the silk is steeped, as also the quantity of water employed, vary from place to place. It may be here noted that in the case of silk dyed to certain shades of yellow, this alum solution is often mixed with the dye; and that in Poona, whenever aniline dyes are used, the silk, after immersion in the alum bath, is subjected to further immersion in a solution of turmeric.

Dyeing.—The indigenous dye of India has been gradually displaced by the aniline or alizarine dye of Europe, and a change has thus come over the spirit of the industry. For some colours (notably red, pink and yellow) the country dye is still in request; but here, too, the European dye is like in time to prove victorious by reason of its cheapness, and of the fact that less labour and time are necessary for its manipulation. Whether the change is wholly worthy of approval, seems open to doubt. Cheap and handy though the aniline dye may be, it

is oftentimes in danger of lending to the fabric a somewhat common character. Moreover, it possesses no durability. The silks of old time were simple, but they were good; neither sun nor rain could dull their colouring, yet they are yielding place to fabrics, the hues of which, though more brilliant, are ephemeral. The nature of the Indian craftsman has doubtless contributed to the change. Ignorant of the science of his industry and powerless thereby to initiate any new departure in his art, he is yet ready to associate himself with any method that may ensure less expense and less personal labour. He has not the ingenuity to enlarge or improve upon the art of his forefathers. Europe spreads before him the fruits of her restless research, and he can but accept and imitate.

Red.—Cochineal is universally used to dye silk red. With it are pounded pistachio nut galls, in the proportion of $\frac{1}{4}$ to $\frac{3}{4}$ of pistachio nuts to 1 of cochineal. Occasionally a certain quantity of sodium bicarbonate and turmeric is added, the soda being supposed to aid the entrance of the dye into the inmost fibre of the silk. All these ingredients are boiled together in water, and as soon as the mixture reaches boiling point, the silk is dipped therein. It is allowed to remain in the solution for one night, cooling gradually, and is then removed, washed in cold water, and dried. The dyers of Belgaum always dye the silk in shade, as the action of the sun causes the dye to fade. Turmeric is added to the solution to lighten the shade of the dye, while immersion in lime-juice and water is also in favour, if a brighter colour be required. Aniline magenta is also added to increase the lustre of the dye.

Yellow.—To obtain this colour, a solution is usually made of *papadkhar* (impure carbonate of soda) and Kapila powder, the reddish-yellow powder which covers the fruit of the Kamila tree (Rottleria tinctoria). In most places alum and oil are also added to the solution, the amount of alum used depending upon the depth of colour required. In Yeola a reddish-yellow is obtained by mixing the Kapila powder and alum in the proportion of 14 to 3. In Gokák aniline yellow is often used in place of the soda and oil.

Green.—Usually yellow silk is dipped in an indigo-bath, or, as in Gokák, silk already dyed with indigo is subjected to immersion in a solution of turmeric. In Sind silk is dyed green by immersion in successive solutions of pomegranate rind, indigo, turmeric, and alum; while in Dhárwár the aniline dye is used in direct conjunction with Kapila powder.

Purple.—A common method of obtaining this colour is to use black silk for the warp and red silk for the weft. If actual dyeing is resorted to, aniline dyes are used. A more laborious process is to steep red silk in an infusion of myrobalans, and thereafter dye it with indigo or with sulphate of iron.

Black.—To secure this colour, the silk is first steeped in an infusion of myrobalans, and for one night in sulphate of iron, is then squeezed, steeped in cocoanut oil or milk, next boiled once again in a solution of sulphate of iron, and when cool, washed in cold water. The silks of Tatta in Sind are boiled in pomegranate peel, myrobalan water, and iron filings. A similar solution is used in Hyderabad, but with a further admixture of flour and sand, which is said to foster the corruption of the silk. In Ahmedabad a purplish black is obtained by steeping red silk in a strong indigo bath.

Blue.—The use of aniline dye is almost universal, and has largely superseded the dyeing of silk with indigo.

Reddish-brown or Snuff-colour.—This colour is said to be obtained in Násik by steeping the silk in a decoction of Acacia arabica (*bábul*), Arabica catechu (*khair*), and catechu powder.

The cost of bleaching and dyeing a fixed quantity of silk varies slightly in different districts. In Gokák, for example, Rs.1 - 9 is declared to be the cost of dyeing 71 tolas of silk red, while in Belgaum it approximates to Re.1. In general, the cost of the process may be estimated roughly at Re.1 per seer of silk.

Sizing.—Having concluded the dyeing operations, the dyer returns the silk to the weaver, considerably reduced in weight. The case of silk dyed black is the one notable exception to the general rule. In order, therefore, to restore as far as possible the original weight, and also to render the thread more suitable for weaving operations, the silk is sized. Arrowroot paste, sugar, gum, and honey, are all made use of in this regard; while the weighting of the thread, in Bijápur, is also accomplished by the use of linseed oil. The process as followed in Násik and Yeola is thus described in the *Bombay Gazetteer*. The thread is first placed upon the "tansála," consisting of a pair of upright wooden bars, about 8 feet high, furnished with a row of glass rings, through which the yarn is passed and drawn tight. It is then stiffened by being brushed over with a dressing of size. This process applies to the warp silk. The weft silk, on the other hand, is subjected to a somewhat longer preparation. It is first placed upon the "phalka," or reeling-cage, and thence wound on to the "asari," or reel. While on the reel, it is moistened with size. The sizer, who is usually a girl, then sits down with the reel on her left hand, and on her right a small wheel, to the axle of which is fitted a piece of reed called "likhádi." Picking out the end of the skein from the reel, she fixes it to the reed and then starts the wheel revolving. As the thread winds off the reel and round the reed, she wets the skein upon the reel with size, and holds the winding thread between her fingers, so that the size is evenly spread over the surface of the fibre.

Warping and Weaving.—The dyeing and sizing operations concluded, the silk is tied into a rough skein and returned to the weaver, who has to wind it on to the reel. Usually this is effected in the ordinary way by means of the bamboo-cage; but in the Southern Division the hank is placed instead upon three smooth sticks standing vertically upon a horizontal wooden base, or, at times when wood is not procurable, fixed in a lump of clay. This process consists in the weaver taking the end of the thread, passing it through a bangle above his head, and thence winding it by hand upon a reel. The thread is then handed over to the warper (in many cases a woman), who stretches it upon the warping-frame.

The warping-frame consists of two upright boards or posts, in which are fixed a series of pegs, one below another. The left-hand post, as one looks towards the frame, contains 13 pegs, the right-hand post 12. About an inch from the end of each peg, a small cross-stick, usually a slip of bamboo, protrudes on either side of the peg. The whole frame is about 6 feet high by 8 feet long, while the pegs which protrude at right angles to the sides are some 6 inches in length. In front of this frame sits the warper upon a stool. On her left-hand side is placed a reel, with its hank of sized and dyed silk; its axis rests upon the ground and is prevented from slipping

by a piece of wood or stone; the cage of the reel is slightly elevated by a support, usually a block of wood or stone, so that the silk can wind off the end without impediment. In her right hand the warper holds a piece of hollow bamboo in the form of a crutch. She first picks out the end of the hank and threads it through the upper arm of the crutch, and fastens it to the top peg on the left-hand post. She then fixes a thin piece of bamboo aslant across the left-hand corner of the frames and below the top left-hand peg: the object of this is to push the back row of threads out of the straight line, running between the two pegs, so that the whole warp will be sufficiently slack, after the slip is removed, to come easily off the pegs. Now it must be borne in mind that the whole object of warping is to make what are known technically as "leases"; that is to say, to arrange the threads in such a way that they will cross one another and remain crossed when taken off the frame and stretched upon the loom. The end of the thread, as mentioned above, is fastened round the top peg of the 13 upon the left-hand side: the warper moves the crutch, through which the thread is passed, towards the top peg of the 12 upon the right-hand post; as she does so, the silk unwinds from the reel. The crutch guides the thread round the outside of the bamboo slip in the left-hand corner, across to the right-hand corner, round the inside of the upper part of the cross-pin, which projects from the peg, round the body of the peg, round the outside of the lower part of the cross-pin, and finally carries it right across the frame to the original top-peg of the left-hand 13, from which it started. Here the thread passes round the inside of the upper arm of the cross-pin, round the body of the peg, then round the outside of the lower part of the cross-pin, and lastly straight across the frame to the second peg of the 12 upon the right-hand side. Here the same process is repeated, and the thread journeys across the frame once more to the second peg of the 13 upon the left-hand post. Thus it is carried backwards and forwards across the frame until it is finally brought to an end at the bottom peg of the 13 upon the left-hand side.

Having reached the bottom peg of the 13 on the left side, the warper makes no pause, but follows precisely the same course backwards, making an upward journey until she again reaches the top peg of the left-hand 13. The whole distance travelled by the thread from peg 1 and backwards and forwards across the frame to peg 13 is fifty-two yards, the ordinary length of the warp. The whole time that the thread is passing off the reel and being guided on to the pegs, it passes through the left-hand fingers of the warper, who in this way modulates the strain put upon the silk by the movement of the crutch in her right hand, and discovers any roughness or lumps in the thread.

The next process consists of heddle-filling, joining, and arranging. If the new warp-threads have to be placed in position and drawn one by one through the eyelets of the heddles and the teeth of the "phani" or comb, a professional heddle-filler has to be called in. But ordinarily there are still lying between the teeth of the comb and the eyelets of the heddles the threads left from an old warp. These are utilised in the following manner. The warper takes down the new warp from the pegs, with its leases still protected by the knots of string, and draws it out lengthwise, so as to form one long stretch of threads, each crossing the other at intervals, throughout the length and breadth of the warp. He then cuts through one end of the warp, and unites the ends of the divided threads, one by one, with the ends of the old warp, which protrude through the heddles and the teeth of the comb. This process of joining new ends to old consists merely in twisting the two ends between the fingers and applying thereto a little gum. The worker next draws the threads of the old warp through and out of the eyelets of the heddles and the teeth of the comb; and they in their turn draw the threads of the new warp, to which they are severally united, into their proper positions between comb-teeth and heddles. The ends of the new warp are then fastened round the square cloth-beam (directly in front of the weaver's seat), round which the fabric is rolled during the process of weaving.

One end of the warp is therefore secured round the cloth-beam; and it only remains to fasten the other end to its respective beam, known as the warping-beam. This end of the warp is left uncut, and sections of it are taken and fastened to the beam, the rest being rolled up into a bundle and suspended over the beam, which, as the process of weaving goes on, moves gradually forward towards the heddles and comb. When it has drawn near enough, a further section of warp thread is loosened from the bundle overhead, and is attached in sections, as before, to the beam, which, relieved of all strain, can be moved back to its original position, about six feet away from the weaver's end of the loom.

The whole warp now lies stretched upon the loom, and merely requires a little arrangement before the weaver commences his labours. The process consists in moving the comb and heddles into their respective positions, taking care that the threads run through them properly, and in untying the knots round the leases. When these knots are untied, each lease is moved by hand into a straight line with its neighbour; and in order that the upper and lower threads of the lease may not get entangled, flat strips of bamboo are placed horizontally between them. The strips are two in number, and lie close together on either side of the point at which the upper and lower threads of the warp cross one another.

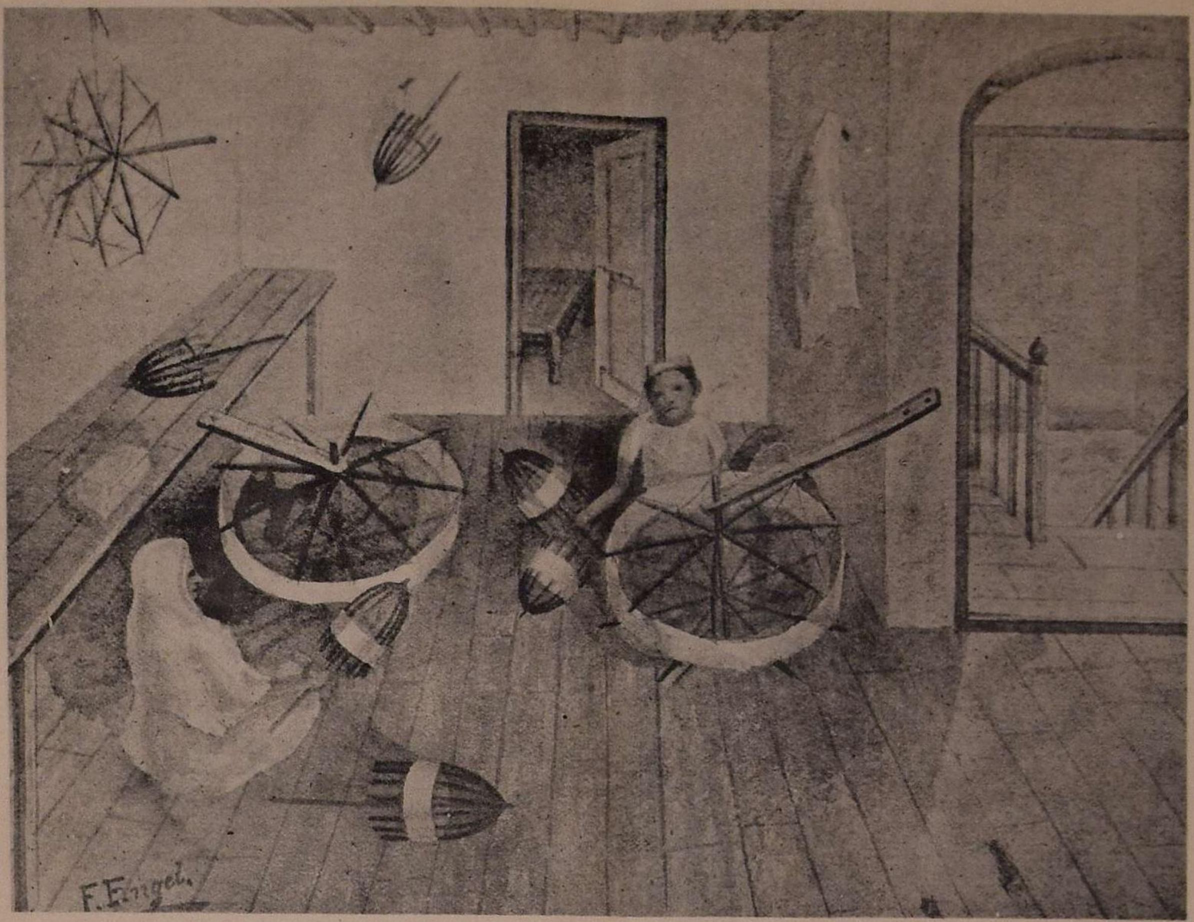
The last process, that of weaving, has now been reached. Before entering into details, it will not be out of place to give a brief description of the loom. Commencing from the weaver's end, the first object of interest is the weaver's pit, some 30 inches long by 15 or 20 inches deep, in which the weaver sits when at work. In front of the weaver is the cloth beam, a solid square bar 4 feet long by 2 to 4 inches broad. The ends of the beam rest in sockets, which enables the weaver, as the work progresses, to slowly turn the beam and roll the web round it. The beam is raised some 2 inches from the floor, and is kept in its place by two strong pegs. Behind the beam, and supported from the roof by cords, lies the frame or batten. Its upper and lower parts are each composed of two pieces of wood, fitting close together. Between them is imprisoned the comb or reed, composed of a series of very thin bamboo strips. Between each of these strips or teeth is passed a fine string, which serves the double purpose of keeping the teeth slightly apart and of fastening together tightly the two pieces of wood of which the batten is composed, and which imprison the ends of the teeth. The frame and reed together weigh heavily, and serve to force home the threads of the weft, after each journey made across the warp by the shuttle. Behind this, and situated in the pit are the treadles or foot-boards, by working which the weaver raises or lowers

the threads of the warp. They are usually two in number and are connected by cords with the under-portion of the heddles. The heddles are two frames, hanging from the roof across the warp, and composed in each case of two rods, one above and one below, connected by loops of thread. Each loop forms a figure of 8, in the centre of which is a small eyelet, through which pass the threads of the warp. One heddle with its thread-loops guides the upper threads of the warp, and the other the lower threads. As the treadles are worked, the heddles move their respective warp-threads up and down, while between each movement the loaded shuttle flies across the warp. Next comes the cross-bar, fixed to the ground on two pegs, and used for raising the warp. Behind the cross-bar the lease-rods lie across the warp, on either side of the cross-juncture of the threads. Lastly one sees the warp beam, about 4 feet long by 2 inches round. On this beam the warp is fastened in sections; and to support both warp and beam, a stout cord is fastened to the middle of the beam, then passed round a fixed pulley or a smooth post, and carried all the way back to a peg on the right hand of the weaver. As the weaving of the fabric progresses, the warp and warping-beam move slowly towards the heddles, reed-frame, and cloth-beam; and the weaver from time to time loosens the rope of the warping-beam, to allow the warp full play, and a further portion of the finished fabric to roll round the cloth-beam. Such is the simplest form of loom. The weaver, seated on the edge of the pit, presses his feet upon the treadles and works the two heddles up and down, and as the latter lift and lower the fibres of the warp, the weaver shoots the shuttle from right to left and back again through the warp. After each journey of the shuttle the weaver draws the reed-frame heavily against the edge of the web, thus forcing home the woof-threads. Occasionally, as in Bombay, the looms are arranged in an upper storey; and in such cases there is no weaver's pit. Instead the cloth-beam and warp-beam are raised off the floor by supports proportionate in height to the depth of the pit found in ground-floor weaving-rooms, and the craftsman sits upon a low stool of wood or cane.

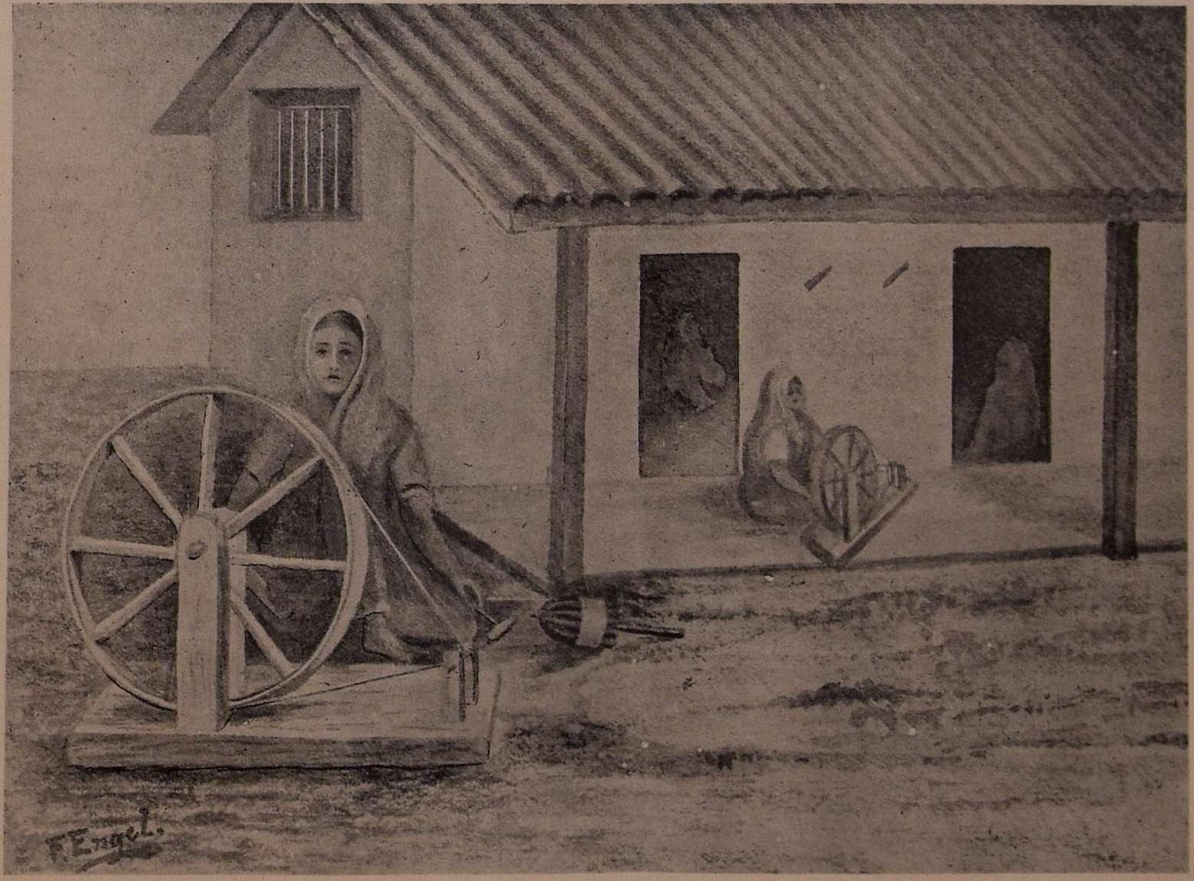
The Finished Fabric.—The finished fabrics may be divided into the following classes:—(*a*) Pure silk fabrics, either plain or mixed with gold thread; (*b*) Mixed fabrics, such as "garbhasuti," in which the warp is cotton and the weft silk; "garbhasuti jari kinar," in which gold borders or ends are added to a mixed silk and cotton web; "reshmi jari kinar," in which gold borders are added to pure silk fabrics; cotton fabrics with silk borders; and lastly, silk and gold fabrics, or gold brocade. With the exception of such towns as Poona, Yeola, Surat, and Ahmedabad, most of the places in this Presidency, which contain hand-looms, turn out but a small quantity of silk apparel.

PAITHANI AS ORDINARILY WORN.

PAITHANI WORN LOOSELY.



a



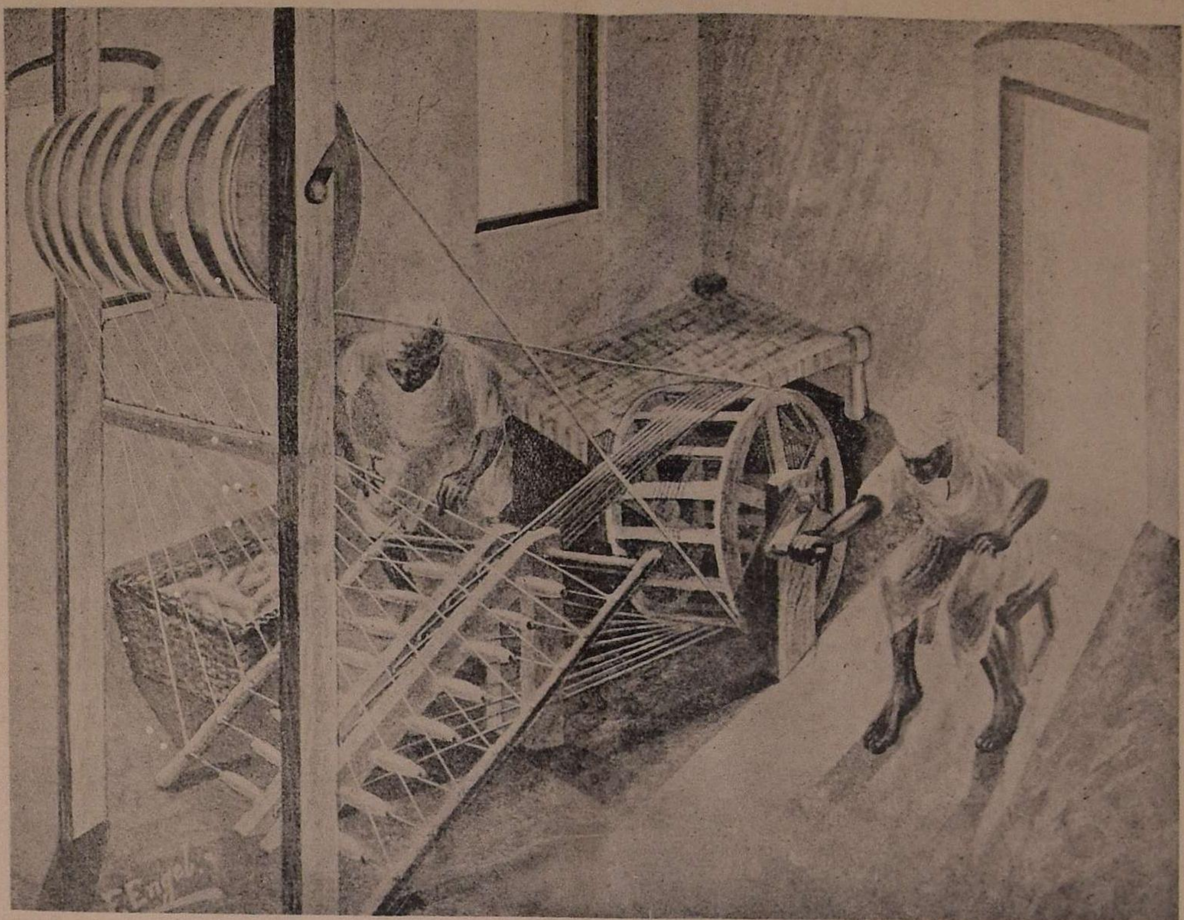
b

I.

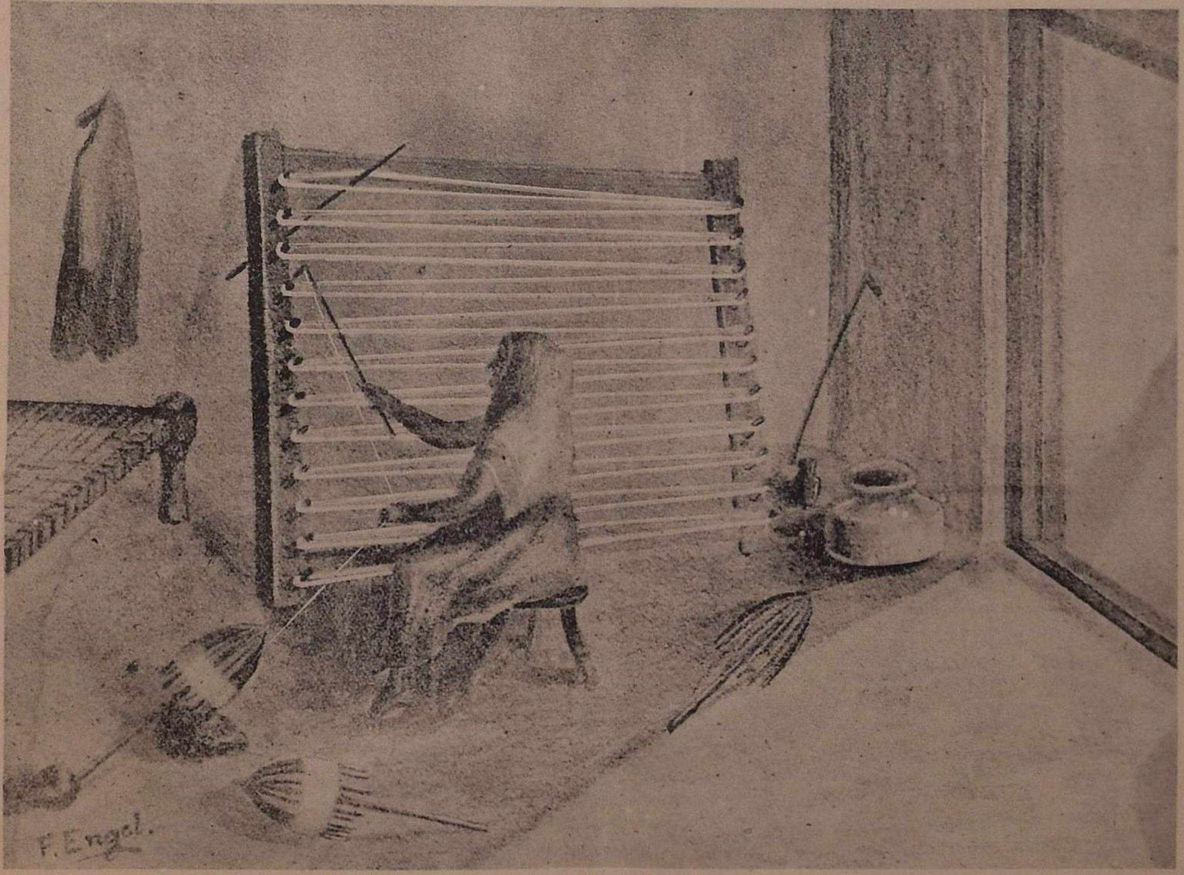
a. Sorting or winding silk from bamboo cage on to reels.

b. Spinning silk from reel on to bobbin by means of the small wheel.

(*Silk Fabrics of the Bombay Presidency*).



c



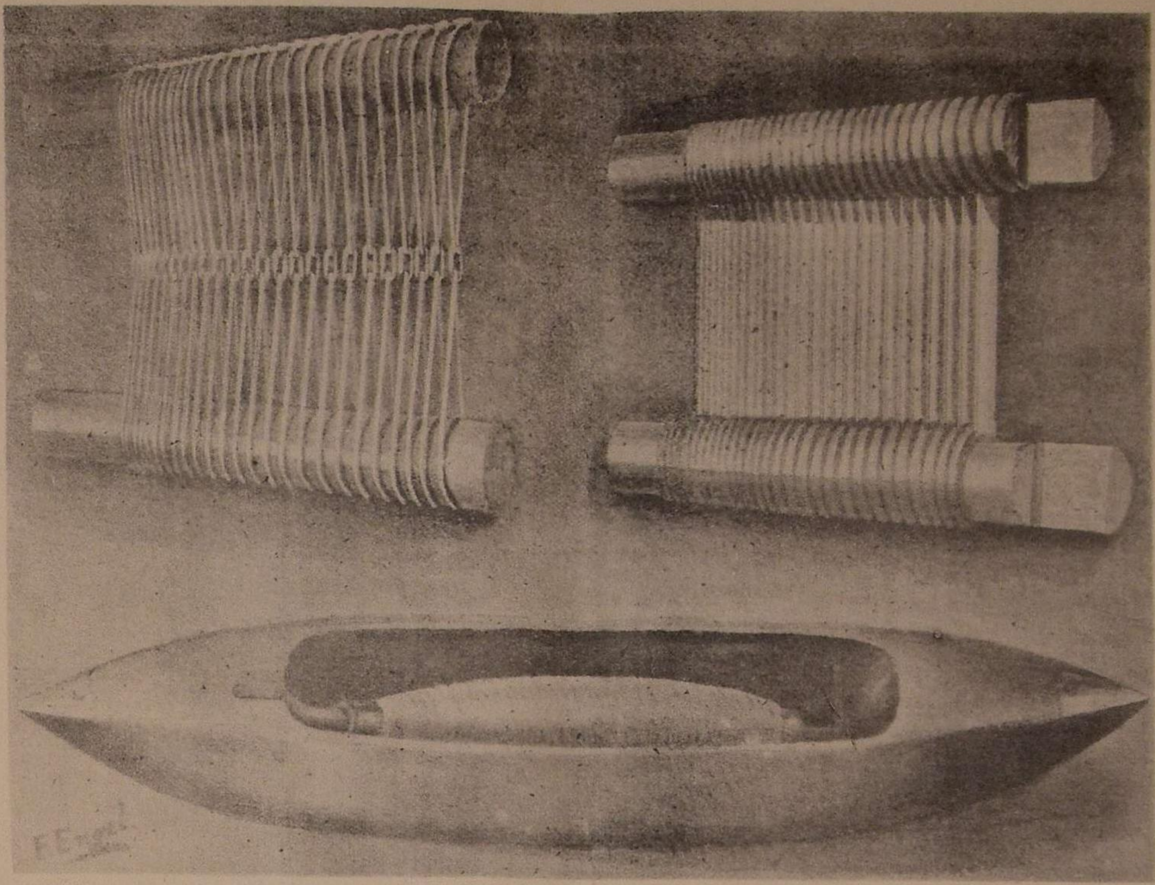
d

2.

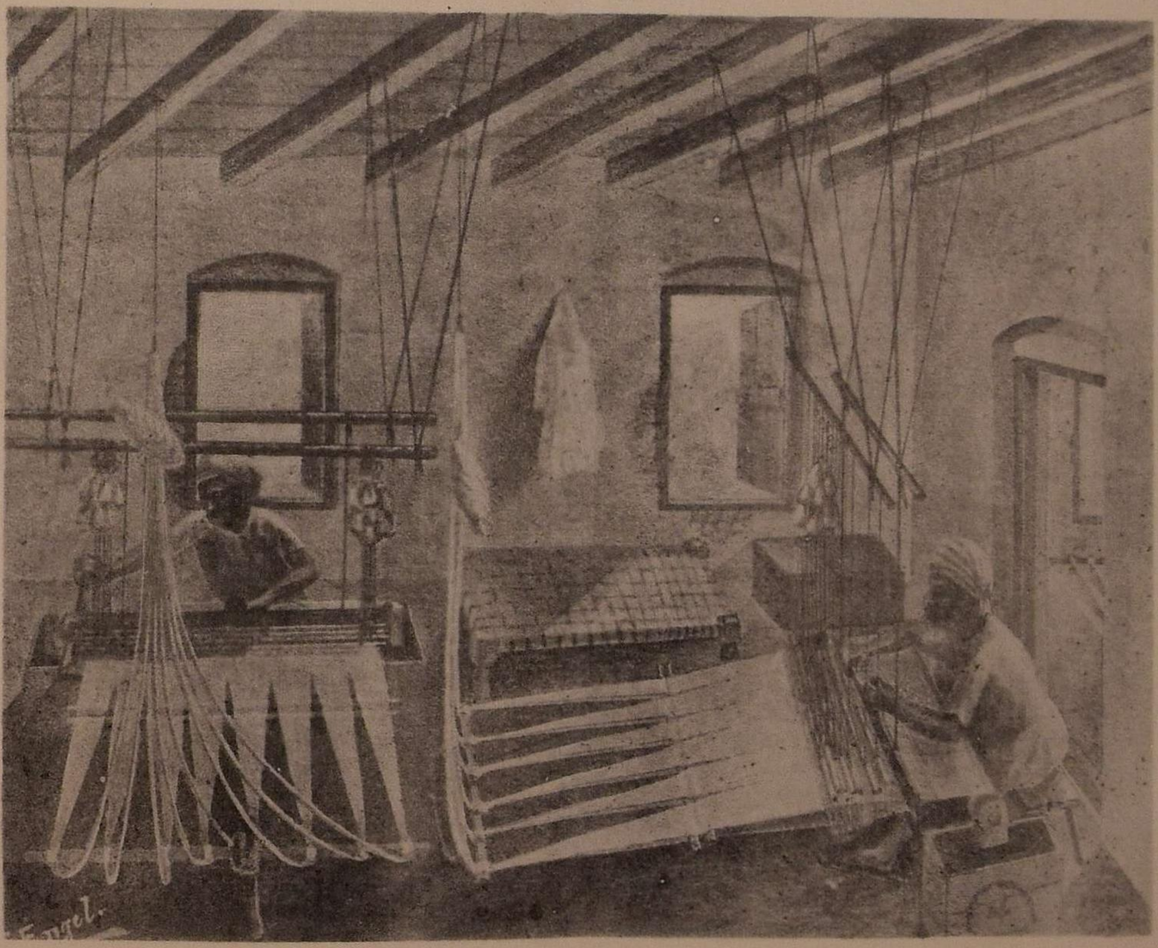
c. Doubling, by transferring thread from bobbin-frame on to the drum.

d. Warping, showing warping-frame, crotch and reels.

(*Silk Fabrics of the Bombay Presidency*).



e



f

3.

e. Part of a heddle or heald, showing eyelets through which the threads pass ; part of a *phani* or comb ; the shuttle.

f. Weaving in an upper storey. The supports of the cloth-beam are fixed in old kerosine oil cases, filled with sand.

(*Silk Fabrics of the Bombay Presidency*).

SILK FABRICS OF THE CENTRAL PROVINCES.

By F. DEWAR, Esq., M.A. (Edin.), I.C.S.

Silk Industries in the past.—The earliest recorded attempt to cultivate the mulberry worm appears to have been made at Kamptee by Miss Calder in the years 1827 to 1831. The attempt was a failure. Trials appear to have been made at Nagpur also, but in 1836 these were acknowledged to have been quite unsuccessful. Years later in Seoni District more serious experiments were undertaken. In 1852 a Mr. Wood appears to have attempted sericulture, but there is no record of his proceedings extant. Then in 1869 Captain Brooke, Deputy Commissioner of Seoni, took the matter vigorously in hand. His notes, both on mulberry and tasar silk cultivation, form the most interesting part of the Central Provinces records on the subject. At first his experiments promised well, but in the second season he found that the mulberry tree would not grow well in the black cotton soil of the district, and the attempt had to be abandoned. In consequence of this failure, Captain Brooke gave it as his final opinion that, instead of attempting to introduce a foreign silk, efforts should be concentrated on the development of the indigenous article, tasar. Although it seems probable that the obstacle of soil was not one which would necessarily prove insuperable in other districts, the failure of this experiment had the effect of shelving the subject for many years. So far as my information goes, no further attempt was made until 1883, when the Deputy Commissioner of Chhindwara, under the instructions of Mr. J. B. Fuller, then Director of Agriculture for these Provinces, carried through a very interesting experiment. Its object was to ascertain whether the climate of the Satpura tract was suitable for growing Japanese silk on the system followed in Dehra Dun. The experiment, carried out on a small scale, was most successful. A supply of Japanese eggs was obtained from Mussourie, and the worms hatched out were fed on the mulberry trees growing in Chhindwara station. There seems to have been no difficulty at all here as to the growth of the mulberry. The silk produced was placed in the hands of experts, and was pronounced to be superior to ordinary Bengal silk, and even equal to some classes of European silk. I have found no record of any more recent experiment, and I am not aware of any private enterprise having stepped in to test the commercial value of the information gained from the experiment of 1883. The District Reports state that at the present day no cultivation of the mulberry silkworm is anywhere carried on, and on the past history of the subject they are, unfortunately, silent. The attention of the Local Government has of late been, in accordance with the advice put forward by Captain Brooke, turned rather to the protection of tasar cultivation than to the introduction of an industry about which satisfactory information had to a great extent been obtained, but towards which private enterprise and capital did not appear to be attracted. But although it has so far been found impracticable to domesticate the mulberry silkworm in these Provinces, there has for many years flourished an industry which imports from other Provinces mulberry silk-thread in a raw state, and works it up into cloths and ornamental borders.

I have been unable to determine the date when this industry originated. Tradition credits both Nagpur and Burhanpur silk with some antiquity, but I have found nothing on record to support the tradition. Burhanpur, under the Moghuls, was an important and busy city. Under the Mahratta and the British rule it has continually dwindled. It is therefore probable that its chief industry was founded in those days of prosperity, and has only persevered in later times because of the strong reputation then early established. But the silk industry there probably did not originate till the eighteenth century. In 1658 Tavernier visited the city and mentions of it—"There is made a prodigious quantity of calicuts, very clear and white, which are transported into Persia, Turkey and Muscovia, Polan, Arabia, to Grand Cairo, and other places." But he says nothing of silk or of the still more notable handicraft in gold and silver wire embroidery. On the other hand, as regards Nagpur, there can be little doubt that the experiments in sericulture undertaken early in the 19th century were suggested by the presence of a silk-weaving industry dependent on a supply of raw material from outside, and were due to the desire to furnish the weavers with locally-grown silk of the same quality. It can, I think, be inferred that in Burhanpur and Nagpur the weaving of mulberry silk has been an industry for at least one century, and probably for two.

The first authoritative mention of it which I can find is that made by Geoghegan, writing in 1872. After recording the repeated failures to introduce the "genuine silk-worm," he proceeds—"Though not producing silk from domesticated worms, the Central Provinces manufacture fabrics in which such silk is used, the supply being obtained either from Bengal *viâ* Mirzapore, or from China by way of Bombay. During the year 1867-68 the imports of silk were estimated at 228,862 lbs., of which nearly one-half was Bengal silk, about the same quantity from Bombay (*i.e.*, China silk), the remainder having been brought up from the Coast into the eastern districts. The imported silk is worked up on the looms of the Nagpur, Bhandara and Chanda districts, either into fabrics entirely of silk, especially women's *saris*, or into handsome silk fringes for *dhotis* and *saris* of cotton. These cloths with silk borders are largely manufactured at Nagpur, and find their way all over the Mahratta country." In this, curiously enough, there is no mention of Burhanpur or of its peculiar form of the industry in which gold and silver wire was interwoven with silk into extremely ornamental fabrics.

In 1874 the Chief Commissioner, at the request of the Government of India, organised a series of sericultural experiments and called for reports from all the districts. The experiments were confined to tasar, but in the course of the enquiry, facts were elicited about imported silk and were put on record in the Note compiled in 1875. The conditions shown differ very greatly indeed from those exhibited by Geoghegan in 1872, and it is unfortunate that in this Note no clear distinction is maintained between silk proper and tasar. The two accounts are very difficult to reconcile. In the former no mention is made of Burhanpur, but Nagpur is credited with a large industry solely engaged on working up mulberry silk. In the latter the place of importance is given to Burhanpur, and Nagpur is said to work only in tasar silk.

In 1883, when another revival of interest in silk industries occurred, a collection of fabrics was received from the Central Provinces and placed in the Indian Museum, Calcutta, where they are still to be seen. These fabrics are of fine cotton and silk thread, in colours, with well worked silk borders, from Pauni and Andhargaon in

Bhandara District, from Umrer in Nagpur, and from Burhanpur. In the 1875 Note no mention of silk, as distinct from tasar, was made in regard to Bhandara District. Geoghegan had mentioned it, however, as working up mulberry silk. It would seem that the industry persisted up to 1883, and was well recognised. In the *Gazetteer of India* (1886) it is stated that in the town of Pauni "a considerable trade still exists in cotton cloth and silk pieces; and the finer fabrics manufactured in Pauni are exported to great distances."

To show the state of affairs at the present day, I can offer only the rough estimates given in the district reports. In Nagpur there is said to be a silk population not less than 6,000 and probably more. In the Nimar district report it is stated that the number of professional silk weavers in Burhanpur now is approximately 1,700, distributed in castes as follows:—Salis, 850; Koshtis, 350; Momins, 500. These figures exclude wire-drawers, flatteners, and *kalabutun* spinners. In Bhandara there is a population of some 4,000 people engaged in working up Bengal silk. The industry is carried on in the towns of Pauni, Andhargaon, Bhandara and Mohali. In Chanda, the only trace of the industry which remains is the habit of tasar-weavers who import a few Bengal cocoons and wind them off along with the tasar cocoons of the district. The silk population of to-day (1901) is, therefore, little less than 12,000, which marks a very striking rise since 1891. At no date for which we have statistics would the imported silk industry seem to have been so prosperous.

This then is the history of imported silk so far as it can be elicited from scanty notes and census returns somewhat tediously manipulated. Up to 1868 the industry flourished, but immediately after that date it suffered a great and sudden decline, caused by the importation of Manchester goods. From 1872 to 1891 it was practically stationary, although generally believed to be in a declining state. And in the present year (1901), although the district reports still speak of the industry as a sadly degenerate one, it has, in point at least of numbers, made a very rapid advance in Nagpur, Nimar, and Bhandara. The other districts have almost entirely ceased to import raw silk.

IMPORTED SILK IN NAGPUR.—The supply of raw silk is at present obtained chiefly from Maldah in Bengal. Some years ago the Rajshahye Division also exported thread to Nagpur, but the weavers found it rougher and more difficult to work, and fell back on the finer article from the filatures of Maldah. This silk is spoken of as being both in yellow and white skeins. The report makes no distinction between Bengal tasar and Bengal mulberry silk, and as Maldah has a large interest in tasar as well as in mulberry silk, I suspect that the yellow skeins spoken of may be Bengal tasar. If so, it would seem to be wound along with mulberry silk, a practice which corresponds with that followed by the tasar-workers of Chanda, who draw threads partly from Bengal cocoons and partly from local ones. No mention is made of any importation from Bombay, and this may possibly have ceased unless the very cheap and shoddy European silk used by the Patwis for fashioning necklets and bracelets is brought in through that port. This stuff is never used for weaving, and as it is sold for Rs.2 per seer it is probably some form of silk waste. There is a small import of raw silk from Benares.

The imported silk in its raw condition is of six qualities known by the following descriptive names:—The *lalkatna*, red thread; the *dó-tana*, double thread; *koré-ká-katná*, undyed stuff; *awál-bharna*, first crop; *majholá-bharna*, intermediate; *narám-bharna*, soft. The prices of these range from Rs.16 to Rs.10 per seer. The importation is done by large dealers, who also to a great extent control all the processes of the industry, paying for the spinning and dyeing by piecework and subsidising the actual weavers.

As has already been noted, the winding of the silk is done by women. These belong usually to the Koshti caste, but Kalars, Mahars, Barhais and Musalmans are also engaged. A woman can clean and wind a seer of the raw silk in eight days, and her earnings are 12 or 13 annas per seer, or about 1 anna 6 pies per diem. If the estimates of the district report are correct as to the number of winders and the total value of the raw silk annually imported, it is obvious that all the 5,000 female winders in Nagpur cannot be continuously at work for more than half the year. This is very probably the case. There does not appear to be anything peculiar in the winding process. It consists of alternate stretching and winding on large and small wheels until the silk is finally made up into equal skeins ready for dyeing. The winder's fingers appear to be the chief instrument for the cleaning and glossing of the silk, and irregularities are worked out by stretching and by pressure of the fingers as the thread passes from wheel to wheel.

Then comes the dyeing. This is done by the Patwis or braiders already referred to. They are a class distinct from the cotton dyers, and there are only 15 of them regularly at work in Nagpur city. The process also is not complicated. The skeins are first washed in water containing a mixture of lime and the ashes of plantain wood. They are then washed with pure water and are dipped in alum water before the dye is applied. The dyes themselves are thoroughly boiled and skimmed before the silk is set to steep in them. They are simple and not numerous. No fugitive aniline dyes are used. Only three colours are produced—yellow, *pistai* (the colour of the pistachio nut), and *kirmani* (worm-coloured or crimson). The ingredients would appear to be lac, haldi or turmeric, and the powder of the kamela fruit. The dyers when in full work make very good wages.

Most of the silk is woven into the borders of cotton cloths, *dhotis, lugras* (or *saris*) and *upernas* (scarves). This is as it has always been. Even in 1867 very little cloth of pure silk was manufactured. Besides Nagpur and Umrer, there are nine smaller towns or villages in which the weavers live. Those in Nagpur turn out *lugras* chiefly, those of Umrer *dhotis* and *upernas*.

The dealers complain of the competition of foreign machine-made goods. The people recognise that these are inferior and less durable, but are attracted by their cheapness. There is, however, no immediate likelihood of a decline in the industry. The weavers are less independent than their brothers in the tasar trade. They frequently get their silk thread on credit from the importing dealers, and consequently become dependents, paying back woven cloths in return. The dealers, on the other hand, say that their business is a risky one, since it is not always possible to realise from impoverished weavers the value of the supplies advanced to them.

IMPORTED SILK IN NIMAR.—In Nimar District the silk industry is mated with another more unique and more famous—the manufacture of gold and silver thread, which is woven into silk cloths. The combined industry

is a peculiarly oriental one. As a matter of course it has, like the making of hand-made lace in Europe, suffered in these days of excellent machinery and practical economy. Time was when the looms of Burhanpur were busy with elephant cloths and royal robes and tapestries that were literally worth their weight in gold. Such are still preserved as heirlooms by native princes.

Burhanpur city was at its best under the Moguls, when it was the capital of a royal province. The Mahratta rule diminished its industries, and of late it has still more greatly dwindled. It is difficult to tell exactly how its silk and gold thread industry has been affected by the advent of the British Raj. At first, without doubt, it fell off greatly. But the census figures about this industry were doubtful. According to them, the population engaged on the combined business never amounted to more than a few hundred; in the present year (1901) it is reported that there are 1,700 professional silk weavers and 1,360 gold and silver wire drawers in Burhanpur. It would appear that of late years there has been improvement, and that the industries are unlikely to decline below their present position. There are numerous highly skilled workmen who only await an opportunity for putting forth their best work (not now called for), and the supply of raw material is secure. There is the inevitable competition with inferior and cheaper goods, however, and this would seem to have had the effect of deteriorating the staple of the Burhanpur outturn.

The chief supply of material is brought from Poona. This is Chinese silk, and as imported it is spun and dyed ready for the loom. But there is also a considerable amount of stuff from Murshidabad in Bengal. This when imported is in a raw state, consisting simply of rolls of fibres. Partly owing to this fact and partly because the silk thread used by the Burhanpur weavers is finer than that of Nagpur, the expenses of cleaning, winding and spinning the silk are heavy. When thread is wanted for *kalabutun* (*i.e.*, silk cloth interwoven with gold-plated silver thread), it costs sometimes as much as Rs.7 per seer to prepare it from the raw material of Murshidabad. The thread is first cleaned and sorted by Dalia and Teli women. Work on one seer takes a whole month, and the women are paid Rs.4 per seer. This is considerably better than the wages earned by female winders in Nagpur, perhaps because there are fewer workers. In Burhanpur there are only 350 or 400 women engaged in winding. The spinning and doubling of the thread is in the hands of a very few workers; they are paid Rs.2 per seer of silk spun. The thread is then ready for ordinary silk weaving, but if intended for *kalabutun*, it goes through another process at the hands of Dhimars, who twist six of the threads into one.

Very little cloth of pure silk is now woven. Pagris are made of silk alone, but its use is as a rule confined to the borders of *saris*, *dopattas* (shawls) and *phentas* (waist-bands), of which the main body is cotton. Besides these, a fabric is turned out in which cotton and silk are mixed throughout the body of the cloth, and to such cloth borders of silk and gold thread are occasionally added. The weavers, however, on the receipt of specific orders, turn out very fine pure silk cloths with more or less elaborate borders. Their average earnings are from Rs.5 to Rs.8 per mensem, which is not high remuneration for skilled labour. As in Nagpur, many of the weavers are financed by dealers. These advance the silk thread and pay for labour 2½ annas per yard of pure silk work. In the case of silk pagris, the most satisfactory of the Burhanpur products from a commercial point of view, it takes a man very nearly a day to turn out a piece a yard long by 7½ inches wide; his wage is therefore less than Rs.5 per mensem. When a fabric of mixed silk and cotton is wanted, the silk alone is supplied by the importer, and he pays for labour 4½ pice per yard. Of this the weaver has to spend 1½ pice in cotton thread, and makes therefore only 3 pice per yard. The weaving, however, does not in this case occupy so much time. A weaver working independently makes a slightly better profit, but it does not often rise much above Rs.5 per mensem.

The workers in gold-plated silver thread are no more prosperous. The processes of the preparation of this article are simple. A bar of silver is first cunningly covered with gold leaf. The bar is then, with much manual labour, converted into fine wire by being repeatedly drawn through smaller and smaller holes pierced in a steel plate. It is then twisted with a silk thread and is ready for weaving. Intertwined with silk thread, it is introduced into rich borders and patterns in the body of the cloth. But the fine heavy *kinkhob* and embroidered *mashrua* are no longer in demand. These fabrics, from the amount of silk involved in the work, pay both spinners and weavers better than the more common cloths. They can still be turned out to order, but orders are few and far between. The *kinkhob*, in particular, was a material largely in demand among native princes when money was lavishly spent on pomp and ceremonial; but during the last fifty years this demand has fallen off, and it is now practically non-existent. Even when finer fabrics than ordinary are ordered, the artizan does not make his former profits, since, being without capital, he works as a skilled labourer only. As a rule, the silver thread is now but sparingly used to enhance the beauty and value of the more ordinary silk and cotton fabrics. Even here there is competition, for imitation gold thread is imported from Europe and occasionally used.

There is no appearance of a decline in the demand for Burhanpur products, but these have to meet a strong competition with cheaper and less fine stuffs from Nagpur, Benares, and Ahmedabad, as well as with highly coloured machine-made silks from Europe. Owing to this competition and to the lack of capital in the hands of the weavers, it is probable that the quality of the Burhanpur fabrics will gradually degenerate. It is unlikely that new economic conditions will arise to improve the staple of the industry.

Imported Silk in Bhandara.—The silk industry of Bhandara District is an offshoot, but a long-established one, from Nagpur, and (as in Nagpur) it would appear at the present day to be not only maintaining but improving its position. In 1871 it had a silk population of some 1,500, and very much the same number in 1881. These figures include tasar-workers, of whom until recently there were many in Bhandara. But in the present year (1901) it is reported that there are 950 houses, or at least 4,000 people engaged in the industry. The towns of Pauni and Andhargaon have long been homes of mulberry silk weaving, and at the present day there are silk-workers in the towns of Bhandara and Mohali also.

The material comes from Bengal and usually through Nagpur. Pauni uses the largest share of this, and in all silk thread worth about Rs.60,000 is annually brought in. This is almost entirely Bengal mulberry silk, but a small quantity of Bengal tasar is also imported. The material imported is not silk fibre, but thread already

wound, and frequently already dyed, in Nagpur. Its cost is Rs.20 per seer, and when dyed, Rs.29. These are obviously very high rates. But the Bhandara industry would seem to be almost entirely confined to weaving. The fabrics produced are usually fine cotton cloths with a border of coloured silk. Specimens of these, sent up from Pauni in 1883, are to be seen in the Indian Museum, Calcutta. The fabric now produced is less elaborate than it used to be, and the quality, as in Nimar, has suffered from competition with machine-made goods. Cotton *dhotis*, *lugras*, and *upernas* are ornamented with a coloured silk border. This is of very simple design, about 3 inches wide, and is made up of the same colours as are used in Nagpur, as is to be expected, seeing that much of the thread is imported ready dyed. The colours are shades of crimson, green, and less usually yellow. A crimson border with a green strip in the middle, the green being set off with lines of white thread, is a common pattern. But the colours run in strips only and are not worked either into mathematical designs or such patterns of flowers and fishes as are to be seen in tasar work. The cloths thus ornamented fetch twice the price of plain cotton, being sold at 10 annas per yard. Occasionally pure silk fabrics are made. They are usually large silk handkerchiefs with a yellow border, and they cost from Re.1 - 14 to Rs.2 - 12 per yard. The staple fabric, however, is the silk-bordered cotton cloth. This is, as a rule, not sold locally, but is exported to Poona and Bombay. Exportation has always been the rule in the Bhandara industry.

Although the extent of the craft has increased, and although the export demand is still steady, the profits of the weavers are poor, not usually exceeding Rs.5 per mensem. This is probably due to the fact that their material is not imported in a raw state and worked up by their own families. Nagpur has a monopoly of the cleaning and winding processes, and a comparison of the prices paid for prepared thread in Bhandara with the price of raw fibre and the cost of cleaning, winding and dyeing in Nagpur, will show how large the profits of the Nagpur importing dealer must be.

Cultivation of the Worm.—The tasar worm (*Antheræa mylitta* or *Paphia*) is fairly hardy and can be found in the jungles of almost every district in the Central Provinces. It prefers, however, a fairly warm and moist climate, and consequently its cultivation in the more northern districts has not become general. Its principal habitat is in the districts and feudatory states of the Chhattisgarh Division, and in Chanda District. The food of the worm is various, and it can be induced to thrive on almost any tree whose leaves are sufficiently large and sappy. But in these Provinces the saj (*Terminalia tomentosa*) is the tree on which it is most usually to be found in a wild state, and it is on the saj that the jungle tribes usually cultivate it. Other favourites are the sal (*Shorea robusta*) and the ber or plum tree (*Zizyphus jujuba*). But the yen, the tinsa, the ajar, the dhaura, the dhaba, the lendia, and the castor-oil plant also furnish it with suitable food. Indeed, in Chanda District, the cocoons are to be found attached to grass stems out in the open, and it is to be presumed that the worm before spinning is fed upon grass. The worms eat voraciously, and an average crop strips a considerable area of jungle.

The breeding season differs slightly in different districts; but the general rule is that the worm or pupa, which has lain within its cocoon during the cold weather and the spring, emerges as a large and very beautiful moth at the end of the hot weather or at the beginning of the rains. The moths copulate, eggs are laid, and worms hatched. The worms feed on shrubs and trees for a period varying from one to two months. Then they spin cocoons, only to emerge again in a few days as moths, and go through the same incarnations as eggs and worms until the final cocoon is woven to be a winter shelter.

There are therefore two courses open to the rearer. If worms are plentiful, he does not need to begin operations till July or August, when he gets in the jungles a supply of wild cocoons, the first crop. From these he gets a supply of worms which he feeds until they spin their winter cocoon. But where wild cocoons are not readily to be found in the jungle, the rearer must preserve a few seed cocoons from his crop of the previous winter, and must feed the first as well as the second crop of worms. The first crop of cocoons which he grows he does not sell; they are still seed cocoons to him. The second crop is not ready till October, November, or December. The work of the rearer therefore extends usually from the middle of June to the middle of October or November; and it is only at the end of October, at the earliest, that the weavers obtain a fresh supply of raw material and can begin their weaving season again.

The Spinning and Weaving of Tasar.—The spinning and weaving of tasar are not two independent industries. They are not locally independent, there is extremely little exportation of silk thread from one district to another, and there is not, as in Nagpur and Bhandara, a class of women who wind and spin tasar as an independent occupation. All the working up of material from the cocoon to the finished cloth is done in the Koshta's own household. The women unwind the cocoons; that is a business in which men never take part. Men and women share the tasks of spinning, stretching and dyeing. The actual weaving is the work of the man alone.

In November or December, the Koshta, usually at the local weekly bazar, secures his supply of cocoons for the year. The more well-to-do he is the larger will be his supply, for if he neglects to buy enough at the beginning of the season, he will find it either difficult and expensive or quite impossible to supplement his stock afterwards. If he is poor, he buys as many cocoons as he can, and when his stock begins to run short, he saves it by working chiefly in cotton and using a few tasar threads for borders only. Many tasar weavers find it expedient to add agriculture to their own industry. It occupies them and their families during what is, from the tasar-weaving point of view, the slack season, the rains, and the early part of the cold weather.

The cocoons as the Koshta receives them from the breeder are hard, gritty, and as unlike silk as can well be conceived. His first business is to soften them so that they can be unwound, and to kill the pupa inside, which might otherwise emerge when its natural winter exposure is interfered with. To effect this the cocoons are first dried in the sun, and then boiled or steamed. The process differs slightly in different districts and even in different households. The skilled weaver is apt to have an infallible recipe of his own for rendering the cocoons workable. Usually a *handi* (or big open-mouthed clay pot) is filled with water and set to boil over a steady fire. With the water, wood-ashes and alum are mingled. The ashes used are various, but the chief point seems to be that the wood or stalk from which they come should be of an oily nature. The castor-oil plant, "Till" stalks,

the "Bemchi," "Jagni," and "Dhotra" are used for the purpose, besides many others. The ashes are sometimes tied up in a bag and placed in the water, and sometimes are merely mixed in loosely. On the surface of the water a tray of grass or straw is placed, and on this the cocoons are laid, two or three hundred to each pot. The boiling is kept up steadily until the water is all evaporated from beneath the grass mat. The cocoons are then tested; those sufficiently soft are laid aside, those still unready being further steamed. When properly softened, cold water is poured over them to remove the ash, and they are set to dry. The gummy matter is now gone and the cocoon is a soft brown skin with the dead pupa inside.

Next comes the woman's peculiar work, the unwinding of the cocoon. The woman sits on a verandah with her legs straight out before her, the left ankle lying across the right instep. On her left she sets a small saucer containing the cocoons to be unwound, and their number varies according to the strength of thread required. From 6 to 8 is the usual number for the better kinds of thread, but in the rains, when cocoons are at a premium, I have seen as few as 3 or 4 used. The outside silk has first to be pulled off. It never unwinds steadily, and a good deal of waste results. But after this peeling, a filament pulled from a cocoon that has been properly softened will come away steadily and easily, without either breaking often or moving the cocoon about. The woman gathers the several filaments together in her left hand and places them against a roller, usually called a *natwa*, which she holds in her right hand. It is a spade-shaped piece of wood with a short handle and rounded-off edges. Holding the ends of the fibres against the *natwa* with the thumb of the right hand, she proceeds to unwind, twirling the handle round three or four turns at a time, and at the same time throwing her hand upwards and outwards. Meanwhile the left hand is busy drawing out and passing on the combined thread that flows from the cocoons. During each upward throw of the right arm and twirl of the *natwa*, the finger and thumb of the left hand make three or four passes up and down the thread, and as the thread goes across it gets a rub between the left palm and the thigh. In practised hands the work goes on very speedily and accurately. With bad cocoons, and especially with pierced cocoons, the breaks are frequent. When these occur, the winder bends over the saucer and with wonderful accuracy pounces on the broken end of the fibre, dips her fingers into a bowl of tamarind and water which is at hand, rolls the end into her thread and spins on. The *natwa* varies in shape in different localities. In Chanda it is not a solid piece of wood, but a framework in the shape of the perpendicular middle section of a truncated cone. As on the outside, so on the inside of the cocoon there is apt to be waste, the fibre sticking to the pupa shell and not unwinding freely. But the amount of this waste depends chiefly on the thoroughness of the softening of the cocoon. The thread has a very good appearance as it is first unwound and lies round the *natwa*, a gleaming belt of a fine dull-gold colour. But the method is extremely primitive. It is much the same as that which was, at the beginning of the 19th century, practised in some parts of Scotland for the spinning of woollen thread.

The succeeding processes of spinning or twisting and of doubling or throwing the thread are no less rude. Small wheels or *rahats* are used which are turned with a handle, and there is a good deal of diversity as to the manipulation of the thread. To twist or spin the thread as it lies on the *natwa*, it is transferred to another and larger *natwa*, and the twist is given by holding the two spindles at an angle from each other, one being held and twirled off in the left hand, and the other in the right hand receiving the thread. But the twist given is not great. To add to it, a good workman will again transfer the thread from the larger *natwa* to a spinning wheel which he works with his right hand. Occasionally two persons are employed at this, one holding the *natwa* and allowing it to revolve and unwind the thread, while the spinner works his wheel with the right hand and gives the thread a twist round a finger of his left hand as he works. Or the skein of thread can be put round an upright drum or cylindrical frame (*chhati*), which revolves on its axis and lets the thread unwind. This evades the necessity of two workers, but methods differ according to the numbers and resources of a household.

The dyeing of tasar is done by the weaver and his own family, and usually thread is dyed only for fringes and borders. The main body of the cloth is left in its natural colour, partly because the weaver's taste tells him that it is better so, and partly because it is cheaper and easier. Tasar is not an easy thread to dye, but the few vegetable dyes in use give good artistic fast colours. Red and yellow are the most usual colours for borders, but blue is also used, and a dark blue which is all but black. For the crimson colour lac is used, for yellow the pollen of the kamela fruit with or without turmeric, and for the blue and black the juice of myrabolams. Turmeric by itself does not give a fast colour, but women's *saris* sometimes have the main body of the cloth dyed with it, and the effect is not so good as the natural colour of tasar. Of late some Koshtas have taken to the manufacture of check patterns, which they make by running narrow lines of crimson or black along and across the cloth. The effect of this also is poor. In the process of dyeing, the skeins are washed through a little lime and water, then steeped in alum water and laid in a pot of boiling dye.

The weaving of tasar does not differ from the weaving of cotton, except that it calls for more careful work, and more elaboration in the border patterns. All the implements are the same as those used for cotton. The warp is first got ready. It is often of stronger thread than that used for the weft, being perhaps five-ply (*i.e.*, 30 fibres) when the weft thread is three-ply (or 18 fibres), but often also the two threads are of equal thickness. The warp is stretched between two parallel bars, and bits of split bamboo are thrust across it to separate alternate threads. By pushing these slips along from one end of the warp to the other, all threads are straightened out into their proper positions. It is at this stage, of course, that the coloured warp threads for the borders are laid out. To ensure a uniform stretching of the thread, a thick brush is pushed along, and any thread which has slack to spare is tightened up.

The loom is a simple piece of machinery. The weaver sits on the ground with his feet in a small pit, and across his knee is the roller, to which the ends of the warp threads are fastened, and round which he rolls the completed cloth every few minutes as he works. In front of him swings the comb, the frame of which is usually covered with rude carvings. It swings freely from the roof, and the weaver pulls it to him sharply with his hand after every double passage of the shuttle to close up the woof. Between roller and comb is a bamboo bow fitted

with pins at the ends which, when the pins are thrust into the edges of the woven cloth, keeps the width regular. Often two short bamboos are used, overlapping at the middle and with their inner ends secured to each other with string. Immediately behind the comb hangs a rod from either end of which is suspended a small pulley-wheel. From these two pulleys hang the "separating-rods." To one rod (by strong cotton thread or string loops) are fastened all the warp threads of even numbers, and to the other all the alternate threads. Each rod has a rope looped to it, which fastens to the weaver's feet. By working his right foot down, he pulls down half the threads and, as the rods hang from the same pulleys, he also pulls up the other half, thus leaving an opening like the opening of a book, across which the shuttle can be thrown. By pressing down with his left foot, he reverses the action—so that all threads previously under the shuttle are now above its passage, and all that were above are below. Behind these again hang similar separating-rods which command the warp-threads of the coloured borders. There may be from two to six of these according to the complexity of the pattern, and they do not interact with each other on pulleys. Each is hung separately over a pulley at the roof, the other end of the rope being evenly weighted, so that the horizontal rod can be depressed by a touch of the weaver's fingers, being raised again by another touch. It is a fair analogy to say that the rods of the warp-threads for the main body of the cloth are worked by the performer's feet like the pedals of an organ, while the border rods are the organ stops worked by the hands. One of these border rods may lift only two threads at each side of the cloth, another may lift twenty, according to the pattern.

Just behind the weaver is a post to which a rope is fastened. This rope passes round a peg at the other end of the room, and is then tied to a rod at the further end of the warp. It keeps the warp lines taut, and from time to time, as his work progresses and the finished cloth is to be rolled up, the weaver has to untie the rope from the post and slacken it out. The motions follow each other in the following order—a downward pressure of the right foot in its rope-stirrup to split an opening across the warp—a throw from the right hand to the left down that passage of the shuttle carrying the woof thread—a downward pressure of the left foot and raising of the right to reverse the upper and lower planes of thread; another throw of the shuttle from left to right—a pull with the left hand of the comb sharply inwards to close up the newly-thrown woof-threads—simultaneously a quick manipulation of the right hand raising and lowering the separating-rods of the coloured border threads. This latter is the point which calls for skill and memory, and a weaver can turn out two unbordered cloths in the time it takes him to make one with coloured pattern borders. In the case of a pattern where coloured woof threads have to be used for the border, the weaver has three shuttles to work for every line, two for the borders and one for the main body of the cloth.

The profits made by tasar-weavers are, as a rule, better than those made by silk-weavers in Nagpur and Nimar, where the craftsmen are in the hands of capitalists. A cloth very frequently made is the *jatha* or *dhoti* and *dô-patta* made in one length, with a division where the cloth may be cut by the buyer. It has a coloured border, is usually woven of four-fold thread, and is from 7½ to 8 yards long. Its price varies about Rs. 11. This cloth would require above 100 cocoons per yard, or say, 1,000 in all. The weaver's profits on each cloth are Rs. 4, and he is able to make between two and three of these per mensem.

It is clear that the work is, on the whole, and especially to a good workman, better paid than is silk-weaving in Nagpur and Nimar. But employment is apt to be irregular, depending as it does on a limited supply of cocoons. For several months in the year a tasar-weaver may have to resort to cotton, using only a few tasar threads for borders, and his profits at this work are not good. But the industry provides a reasonable competence, especially to the Sambalpur and Bilaspur weavers. Yet their numbers are declining because there is not a sufficient supply of raw tasar to keep the looms busy throughout the year.

Conclusion.—It would seem to be clear that the imported silk industry in the Nagpur, Nimar and Bhandara districts is in a prosperous condition, and may be expected to improve. From the recent returns of rail-borne traffic it appears that year by year the import of raw silk from Bengal increases. Even in 1899-1900, during half of which famine conditions prevailed, the import was 2,491 maunds, valued at Rs. 12,50,936 as against 2,191 maunds, valued at Rs. 10,99,589 in 1898-99. The industry is well able to hold its own against the competition of machine-made silk. There has been, however, a decline in the quality of the staple fabrics. The condition of the workers also has declined as the industry spread, and now it seems not improbable that the next step may be the introduction of machinery, in Nagpur at least, and the reduction of the weavers to the position of factory hands.

The position of the tasar industry is doubtful. If the statistics gleaned from census tables are to be trusted, the trade is gradually dying out. There has been a fairly steady decline since 1872. The standard of workmanship has not, however, perceptibly fallen, and the local demand for tasar fabrics is strong enough to ensure fair profits to the workers. The question of the supply of tasar cocoons is the only pressing one.

a

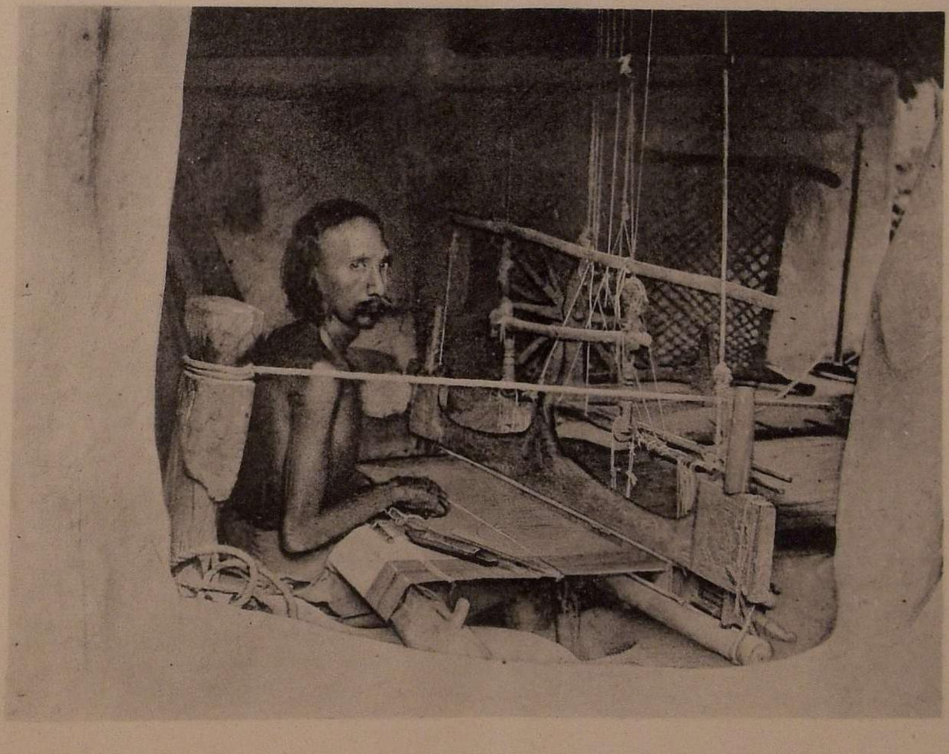
b

4.

a. Woman reeling tasar cocoons.
b. The *asari*, *chhati*, and *jantur*.

(*Silk Fabrics of the Central Provinces*).

c

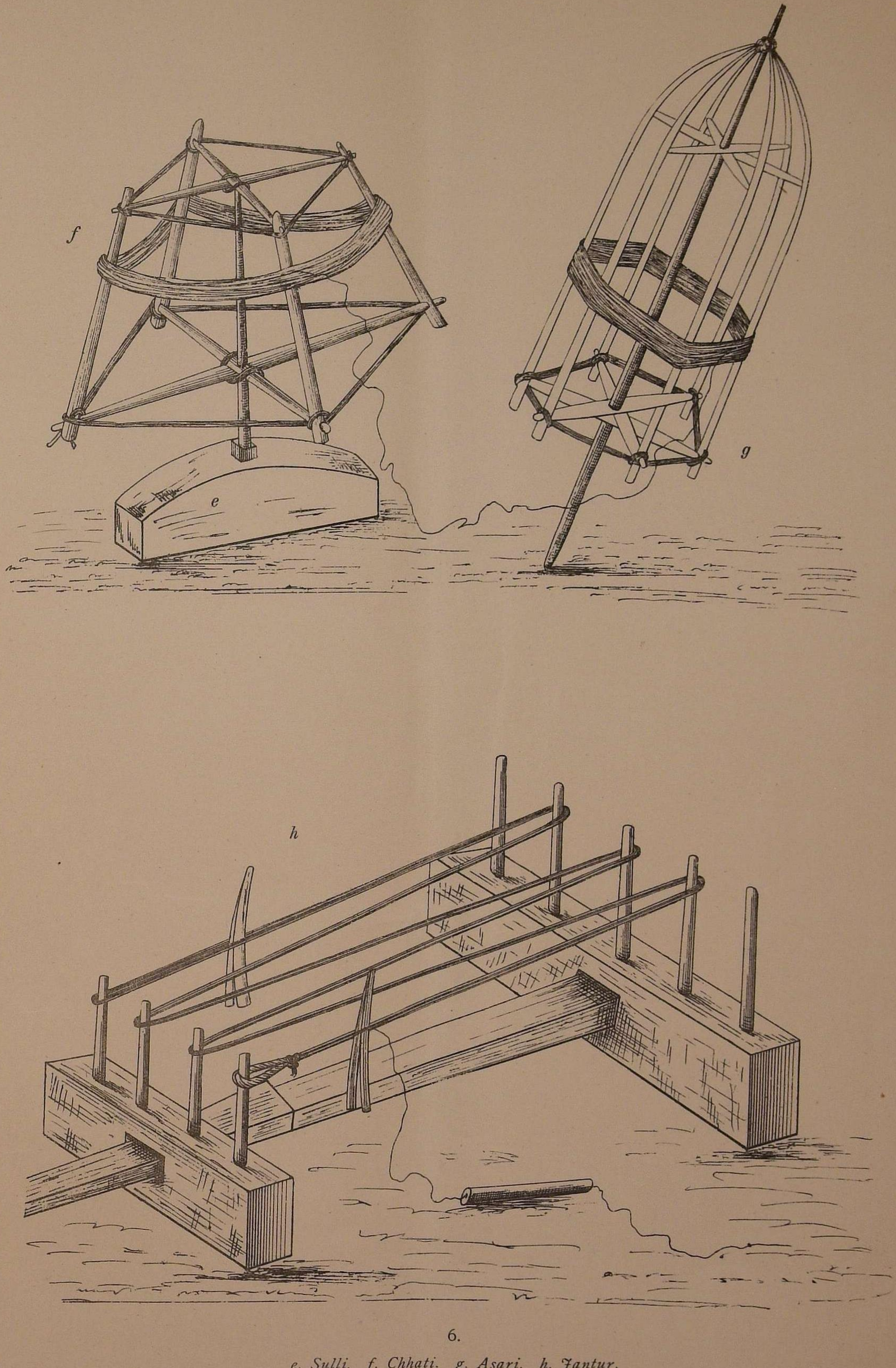


d

5.

c. The laying of the warp.
d. The loom.

(*Silk Fabrics of the Central Provinces*).



6.

e. Sulli. f. Chhati. g. Asari. h. Jantur.

(*Silk Fabrics of the Central Provinces*).

SILK INDUSTRY IN THE PUNJAB.

By W. M. HAILEY, Esq., C.S.

For practical purposes silk-producing *Lepidoptera* may be said to be divided into two main classes, "mulberry fed" and non-mulberry fed" silkworms. The former are usually known as "domesticated," the latter as "wild," though as a matter of fact there are several species of non-mulberry feeding silkworms which have been continuously reared in a state of domestication. In dealing with the subject at its present stage, it will be useful to retain this distinction, which also, as a matter of fact, corresponds clearly with the entomological classification of silkworms into their two main classes *Bombycidæ* and *Saturniidæ*.

It is claimed by Sir T. Wardle, in his "Handbook of Indian Wild Silks in the South Kensington Museum," that the "wild" silks of India may, with the aid of enterprise and capital, yield to systematic collection and cultivation a result as profitable as that which has attended the scientific culture of tea and cinchona. It has more than once been contended that the climatic conditions of this country are far more favourable to the development of the industry in "wild" silks than of that in the produce of the mulberry-feeding worm. The subject, therefore, is one of considerable importance, and claims a prominent place in any treatise dealing with the potential resources of an Indian Province. It would appear from the "Dictionary of the Economic Products of India" that there are in all thirty-one species of *Saturniidæ* or wild silkworms found in India. It is admitted, however, even by those who may not unfairly be described as the professed champions of the "wild" silkworm, that only three of these species have so far been proved to be of any economic value: viz., the *Antheræa paphia* (Hindi, *tusuru*), which yields the tasar silk of commerce, the *Attacus ricini*, or castor-oil silkworm which yields the silk known as "*eri*," and the *Antheræa Assam* or *múga* worm which produces the silk known as "*múga*." Neither of these three silkworms is at all common in the Punjab. Although the Province is shown by Sir Thomas Wardle as one of the places where the *tasar* moth is common, yet the *Antheræa paphia* or *tasar* moth proper is, says Dr. Watt, "practically absent from the Punjab," and the moth known as the *tasar* in the Province is not the true *Antheræa paphia*. The *eri* silkworm is not found at all, and though one authority includes Kángra in his list of the districts where the *múga* worm is found, it would not seem that this is correct. It is, indeed, probable that it is not found further west than Dehra Dún. While, however, the Punjab is thus entirely deficient in the "wild" silkworms which are commonly recognised as those of chief economic value, there are a certain number of *Saturniidæ* found in the Province, some of which are capable of yielding silk. These are altogether eight in number, viz., the *Actias Selene* (Simla), the *Antheræa Roylei* (Simla), the *Antheræa Sivalika* (mainly in Hoshiárpur), *Attacus Canningi* (Murree), the *Attacus Cynthia* (Simla and Kángra), the *Caligula Simla* (Simla), the *Rinaca Zuleika* (Simla), and *Saturnia Grotei* (Kulu). It will be seen that these silkworms are found, with one exception, in the Upper Himalayas.

Under the head of mulberry-feeding, or domesticated silkworms is included the second of the two families of silkworms, namely, that known to entomologists as *Bombycidæ*. Those commonly cultivated in Japan, Central Asia and Southern Europe differ from those cultivated in India, in the fact that they flourish in a temperate climate, require cold for the hatching of eggs, and are "univoltine" (*i.e.*, produce one crop in the course of the year); while those commonly cultivated in India are multivoltine, thrive in moist, sub-tropical climates, and do not require cold for the hatching of their eggs. The latter variety, though giving several crops in a year, of a quality not altogether inferior to the Chino-European species, nevertheless produce silk so loosely wound on the cocoon that it is difficult in reeling it off to avoid entanglement. For this reason various attempts have been made to rear in the more temperate parts of India *Bombycidæ* of the variety cultivated in Europe, China and Japan. Next to Kashmír, certain districts of the Punjab have formed the chief scene of these experiments. It is this fact which gives, for the present purpose, the chief interest to the study of mulberry-feeding silkworms.

There are altogether some seventeen varieties of *Bombycidæ* found in India. Only three of these species have been found wild in the Punjab, viz., *Ocinaria lactea*, *O. Moorei* (both found in Kulu, but neither of any value), and the *Theophila Huttoni*, found in Simla by Captain Hutton in 1837, but which proved to have no practical value. Of imported worms two, the *Bombyx Croesi* and the *Bombyx mori* (the Chinese mulberry silkworm cultivated in Japan, Central Asia and Southern Europe), have been at various times domesticated in the Punjab. The former is a multivoltine silkworm originally introduced from China, of a far less valuable type than the latter, which is a univoltine species commonly accepted in Europe as yielding by far the most valuable results to systematic cultivation. It is in connection with the domestication of this variety that the most consistent efforts have been made in the Punjab.

"Wild" Silks.—The value of the produce of the "wild" silkworm has been recognised almost from the beginning of the British occupation of India, and it is not surprising to find that the history of the attempts to systematically utilize the worm in the Punjab dates soon after the annexation. In 1858 the Financial Commissioner issued a circular letter stating that a method had lately been discovered by which the fibre of the tasar (*A. Sivalika*, not the *A. paphia*) could be detached from the cocoon and adapted for the loom without unwinding it. "As a consequence, certain parties in Calcutta have taken up the matter; and are anxious to obtain the cocoons of the above worm in any quantities that may be obtainable." An English merchant at Harriki was prepared to purchase them at Kálka, at Rs.4-8 a maund. Writing in the same year to the Chief Commissioner, the Financial Commissioner (Sir D. Macleod) expressed his opinion that the tasar could "by judicious arrangements" be reared to any extent and rendered highly remunerative. The natives were, he says, entirely ignorant that silk could be produced from the cocoon, "to which alone I believe it is owing, that the only use they have hitherto made of the cocoon is to cut it into strips as a binding material for the stocks of their matchlocks."

Sir Donald Macleod then goes on to suggest that worms should be hatched out from the eggs of the moth and applied to the trees, and the cocoons gathered and removed. Experiments in this direction do not, however,

seem to have been made until 1884, when Mr. Coldstream, C.S., then Deputy Commissioner of Hoshiárpur, attempted to domesticate the *A. Sivalika*, more or less on the above lines. He utilized the agency of zaildárs and lambardárs to collect the cocoons, which he kept in bamboo cages until they were ready to burst. This took place in June or July, at the beginning of the rains. The eggs obtained from the female moths were hatched out in open baskets, and the young worms were, when a few days old, placed out in the open on *beri* trees. An attempt to feed them by hand ended in failure. The *beri* seems to have proved to be excellently suited for the purpose, as after being denuded of its leaves in the rainy season, it will, in a few days, send forth an abundant supply of fresh leaves. The *sawani* was also tried, though with less success than in the case of the *beri*; experiments with other trees failed. At the same time, it does not appear that any very complete measure of success attended Mr. Coldstream's attempt to cultivate the worm. In hardly a single instance did he manage to increase the original stock; in some cases he even finished with fewer cocoons than he had started with. But he found no difficulty in reeling off the silk from the cocoon.

Up to the present, it cannot be said that we have clear evidence that the Punjab can produce tasar silk. The problem is, in the first place, to increase the number of collected cocoons by judicious hatching out of the eggs and by "planting out" the young grubs on properly situated groves of *beri*. Unless this can be done on any considerable scale, there is *primâ facie* but small chance of success. The spinner employed by Mr. Coldstream could only earn five annas a day *when supplied with his cocoons free of charge*. There is, however, another direction in which the *A. Sivalika* might with advantage be exploited. One great objection to the development of the Indian tasar silk industry is the imperfect and faulty system of Indian reeling. This fact is at once established by the published figures of the tasar reeled fibre, the Italian or improved fibre yielding three or four times the price of the ordinary native reeled silk. The ease with which Mr. Coldstream's silk was reeled may perhaps be accepted as an indication that the *A. Sivalika* would yield good results under the improved reeling process, and it would be at all events interesting to ascertain whether this were or not the fact.

The Mulberry-fed Worm.—If the attempts to exploit the wild silkworm have been somewhat meagre, the same cannot be said of the efforts made to domesticate the mulberry-fed species. There is no mulberry-fed silkworm of any value naturally indigenous to the Punjab. Two facts have, however, encouraged the hope that the Province would prove to be the best breeding ground for imported *Bombycidæ*. In the first place, mulberries flourish freely in many districts. In the second, the more favoured parts of the Province combine a temperate summer climate with a cold winter, and this fact from the first inspired a belief that the Punjab would afford unusually good opportunities for domesticating the *Bombyx mori*, the best and most valuable type of the mulberry-fed moths, which requires a cold climate for the hatching of its eggs, and has, on that account, received most attention in Europe.

The exact amount of silk rearing now carried on in the Punjab is very small. The Census Report of 1891 does not give the numbers of silk-growers. The reports received from District Officers during 1898-99 show that there are now only two districts, Kohát and Gurdáspur, in which the moth is cultivated at all. The Deputy Commissioner, Kohát, states that about twenty men cultivate silkworms at Dallan, a village situate at the western end of the Darrah Valley (Teri Tahsil) on the Waziri border. They obtain their eggs from the Kurram Valley. At present the chief place of cultivation in Gurdáspur is Behrámpur.

Manufacture—Extent.—While sericulture, therefore, cannot be said to exist as an industry in the Punjab, there is, on the other hand, a manufacture of some importance carried on in the Province. While the net import of raw silk has increased during the last ten years, it is noticeable that the imports from Bokhára and Kábul have largely fallen off. This is, no doubt, mainly due to the high export duties imposed by the Amír, and is part of the general decline in the trade of Afghánistán with British India. It is possible that the small increase in imports *viâ* Ladákh observable in recent years may be due to the fact that the Central Asian silk now reaches India in preference by the Karakoram route, and no doubt a certain part of the Bokhára silk also reaches India by the Persian Gulf and Bombay. But these remarks do not by any means exhaust all the facts of the case. The decline in imports from Bokhára and Kábul has been accompanied by a decline in the import of Indian raw silk from Bengal. The Punjab manufacturer has no doubt begun to appreciate the fact that the China and Japan silk imported from Bombay takes colour far better, and is easier to work, than either the Central Asian or the Bengal variety.

Next to Burma, the Punjab was, in 1891, the Province which used the largest quantity of raw silk for the purpose of manufacture. Since that date, however, the relative position of the Punjab would seem to have declined, owing to the competition of the Bombay and Calcutta mills. At the same time it is obvious that the quantity of raw silk used in the Province has shown of recent years a tendency to increase rather than decrease, and it is not possible to endorse the opinion expressed in the majority of the District Reports that the manufacturing industry is rapidly declining owing to European competition. The net import of the raw material is very nearly 6 lakhs of pounds. The provincial valuation of Indian silk piece-goods is given in the Internal Trade Report at about Rs.7 per lb. On this showing the total value of the manufactured product should be at least 40 lakhs.

Centres of Manufacture.—It must be premised that there are four distinct operations included in the term manufacture (viz., reeling from the cocoon, preparation for the loom, dyeing, and weaving or embroidering), and that there are but few places in which all four operations are carried on. Probably Amritsar is the only place in the Province in which much reeling is done, as the amount of silk produced and reeled at Dallan (Kohát) and in Gurdáspur District must be very small. Silk is prepared for the loom at Peshávar, Kohát, Jullundur, Amritsar, Lahore, Mooltan, and Delhi. It is dyed in the same places, and in addition at Siálkot, Shahpur, Dera Ghází Khan, Jhang, and Rohtak. The silk, prepared and dyed, is woven in some form or other in most districts of the Province, with a few exceptions. It is probably used for embroidery in every district of the Punjab.

Processes of Manufacture.—Reeling from the cocoon: The cocoons (*kaunta*) are dipped in boiling water and battered about till the gum has all softened. The threads are then collected by means of a birch brush, and the number needed for the required deniers are crossed together and placed on the hank reel, which is then put in motion and the silk wound off on to it. In native use thick thread is far more popular than the finer counts, and a good many strands are usually reeled together. No improved method of reeling seems to have been introduced in the Punjab, though several Kashmírís living at Sujánpur are said to have acquired great manual dexterity in using the above method, owing to their employment under European supervision at Messrs. Lister's filature. The best men will reel from 4 to 5 chittáks of silk daily, using for this purpose 16 chittáks of foreign cocoons or 20 chittáks of country cocoons. Scarcely any silk reeling is now done in the Punjab. Such men as are employed on this work in the Gurdáspur District receive Re. 1 a sér of silk and their food.

Preparation of thread for the dyer: Raw silk imported from Central Asia, China, or Bengal is seldom fit for use until it has been rewound and properly cleaned. With the exception of the *sikka* (Singapuri), *gungru* (Bengali), and *kattar* (Bengali) varieties of silk, all imported silks are sent to the *patphera* or winder before they can be consigned to the dyer. The method of winding the silk is briefly as follows:—The *patphera* first opens the skein and puts one end on the *charkha* which is fixed on a wall some feet from the ground; the other end is passed over the *uri* or *dhaniri*, which is movable, and is placed so that the skein is stretched tight. If the silk be of good quality and easily reeled, he picks out the thread with one hand and transfers it to a small spindle or pinion, which he holds in the other hand. If the silk be much tangled and needs careful winding, he takes the *tabeel* or *tahvil*, which is fitted with a small handle, and winds the silk on to it. The object is to disentangle and equalize the threads, which, when broken, are deftly mended with the tongue. He then unwinds the silk from the *tabeel* on to a spindle (*úras*) which he holds in his hand. Each skein contains several qualities of silk, and he transfers each quality to a separate *úras*. The silk intended for the *táni* or warp is then taken in hand separately by the *patphera* or sometimes by a different man, the *tanzi* or *tewdi*. The thread is too slender for working, and two or three threads are "thrown" together. The method discovered by the Italians, and long kept secret by them, until stolen by John Lombe of Derby, gives the thread a double twist. The Indian method only gives it a single twist, and no improvement seems to have been made in this respect. At Jullundur, however, a machine worked by a wheel is in use, which works from 20 to 30 *charkhás* at the same time and thus twists a number of *tánís* by the same operation.

Dyeing: The silk is now ready for the dyer. With a very few exceptions, all silk when imported is of a white or yellow colour. Dyeing is carried out either by a special silk dyer (*patrang*) or by the ordinary *rangrez*. The silk seems to be invariably cleaned by boiling in a solution of *chúna* (lime), *sajji* (carbonate of soda) and water. To this sweet oil is sometimes added. No substitute seems to have been found as yet for this somewhat strong detergent, which is, however, undoubtedly effectual, though silk loses weight heavily after immersion in it. After being washed in cold water, the silk is boiled or steeped in a solution of alum in order to prepare it to receive the colour. Aniline dyes have to a great extent superseded the indigenous dyes, being cheaper, easier and quicker to work, and give a better gloss. At Amritsar a good deal of use seems to be made still of country dyes, and they are said to be used regularly at Dera Ghází Khan. Indigo is still used for all combinations of blue. The colours mainly used at present seem to be—*Sabz*, green; *zard*, yellow; *gulnár*, scarlet; *golabi*, pink; *surakh*, red; *krimchi*, crimson; *firozi*, blue; *asmáni*, light blue; *dháni*, pale yellow; *khatta*, yellow; *sharbati*, yellow; *fákhtai*, dark grey; *safed*, white; *siah sabz*, dark green; *bhura*, buff; *jogia*, salmon; *sandli*, brown; *badámi*, almond; *káfúri*, dull white; *narangi*, orange; *uda*, purple; *kásni*, mauve; *sunahri*, light tan.

Weaving.—After the dyer has finished with the silk, it is handed back to the *patphera* to rewind. He does this by simply taking the silk and running the thread on his fingers, winding it into a skein. In cases where an additional gloss is required, the silk is rubbed with an iron pin. It is then sent to *juláhás* or *bandi pánewálás*, who, after dipping the thread into starch or gum, stretch it on the loom and give it to the weaver. The process of weaving, whether the object be to produce a pure silk fabric or a fabric of mixed silk and cotton, is exactly similar to that adopted in weaving cotton.

In making *azárbands* the process is rather netting or webbing than weaving. The prepared thread is first stretched tight on four pegs placed in a quadrilateral on the ground. It is then taken off on to two sticks, the top stick being fastened to the wall, and the lower held between the feet. The silk being thus stretched tight, the maker takes a number of bobbins of reed or *pamber* about a foot long, and places one crossways through the silk in such a way as to divide it into upper and lower strands. Then taking a strand between two fingers, he proceeds to twist the strands in and out from right to left, and on reaching the end of the row, places a bobbin beneath it. This operation is repeated till the whole is laced together, when the bobbins are withdrawn and the interlaced strands secured by a knot. The material formed is really a kind of lace in which the threads are twisted instead of knotted. Occasionally a *shísham* wood frame is used. The above method is also used in making hair nets and similar ornaments. The work is usually done at home by women in their leisure hours, but a considerable number of persons are employed on this work exclusively at Amritsar and Mooltan, on wages varying from 3 annas to 8 annas a day.

In *patoli*-work (silk-braiding) the workmen use mainly the coarser kinds of silk for stringing jewels, but also use the better counts for ear ornaments and bracelets. Mrs. F. A. Steel speaks of their work as follows:—"These are to be found in every bazár, and a large quantity of silk must pass through their hands. They seem always busy, and I should put them next to the comb-makers in steady attention to business. . . . They are extremely ingenious and neat-fingered in making the various twists, knots, cords, plaits and tassels used in their trade. I have seen a cord for fastening the silver ornaments in a bride's hair which in variety of knots equalled any halyard. Necklets, amulets and wristlets are all mounted by the *patoli* on silk with a greater or lesser admixture of tinsel. The quantity of silk used in an ordinary *nani* such as is worn by most women is about 4 annas worth, and it will last a year or perhaps longer. The *patoli* also makes *dagi* or ear-ring suspenders, to be worn when the ear holes

have been torn through. The better kinds of these are very expensive, as much as two rupees being sometimes given for a pair. He also knots and fringes the ends of bridal *azárbands*; indeed, his work is indispensable in women's dress. But it is during the months of Sáwan and Bhádon that the *patoli's* work is in greatest request, and a considerable amount of silk must be used at these times. The *sáwani* or rain festival begins on the first Sunday in Sáwan, when the sweeper girls put on the silken ear-rings called "*phummans*" from the tufts or balls of floss silk employed in their manufacture (Anglicè, *pompoms*). On the second Sunday the Musalmán girls follow suit, and on the third the Hindús. As there is a good deal of emulation as to which festival shall be the smartest, the number of these ear-rings worn by each girl is considerable. They cost about a pice a pair, and are made of *phummans* of seven different colours, one for each day of the festival week. The custom is universal in the Punjab, and the ear-rings worn by the wealthier classes are very elaborate, costing as much as four annas a set. On the first of Bhádon again, every Hindu wears a wristlet of silk decorated with *pompoms* of various colours (*rakri*). The *patolis'* price for these averages one pice, but the Brahmans who go round to their constituents and put them on, receive fees in proportion to the wealth of the family. These wristlets are worn in commemoration of Rám Chandar's departure from his father's house to rescue Sita from her enemies, and are supposed to preserve the wearer from harm during the year."

ARTICLES PRODUCED.—Silken manufactured articles produced in the Punjab may be divided into three classes: (*a*) woven fabrics of pure silk; (*b*) woven fabrics of silk and cotton; and (*c*) netted fabrics of silk or silk and cotton. It should be noticed here that it is unlawful for Musalmáns to wear pure silk fabrics, and this no doubt accounts for the large manufacture of silk and cotton goods (called generally *mashru* or "permitted") in the western half of the Province.

EMBROIDERY.—Wearing cloth of every kind is embroidered. The work may be said to fall into two classes. First, there is the ornamentation of caps, table centres, &c. (which forms the chief part of the Delhi industry), *phulkáris*, *bághs*, and *chogás*. Secondly, there is the work (*bel bunta*) done by women on garments for their own wear. *Phulkáris* and *bághs* are known by a great variety of names according to the colour and pattern of embroidery used. There is, for instance, the *dabla* (yellow silk), *akhor* (yellow, green and white), and many others. The slightest difference in pattern seems to warrant a change in nomenclature. The *búnd* is worn as a covering by a bride on the first day of her marriage; the *sirga* is given by the bride's relations to the elderly persons present at the marriage.

USE OF SILK FABRICS.—There is a general belief that the silk industry of the Province is falling off, that less raw silk is imported and less manufactured, fewer hands employed, and the reason of this decline is said to be the diminished demand for silken clothes. "European cotton goods, printed calicoes, and cheap broadcloths have turned silken garments out of the field. Even for purposes of embroidery, cotton thread, dyed bright colours, is said to be supplanting silk." This is, no doubt, true. The use of silk for wearing apparel is said to have been common in Sikh times: the use of pure silk is certainly not common now. Even the embroidery of *phulkáris* for domestic use seems to be no longer so popular as formerly. "The women," says Mrs. Steel, "themselves admit their preference for the gaudy imitations of Manchester. Of course, a real *phulkári* or *bágh*, according to the wealth of the house, must be worn by every bride during the *phera* ceremony of marriage, and a certain number of embroideries will always be found in the trousseau; but these become more and more for show, and do duty in many outfits."

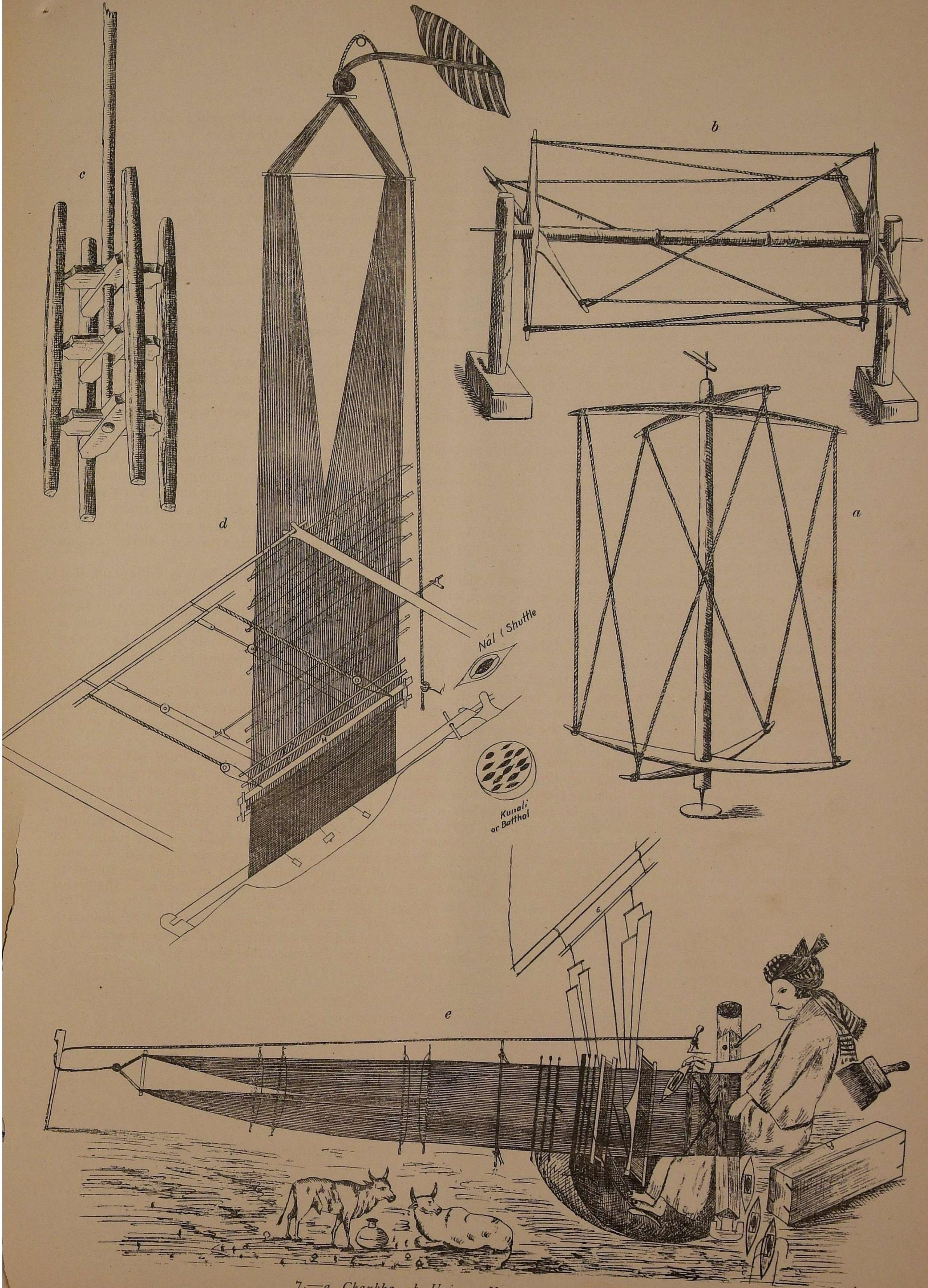
To statements such as these quoted above, however, there are certain qualifications. Pure silk *dupattas*, *langhás* or *shalwárs* of *daryai*, *gulbadan* or *kanawez* are doubtless worn far less than before. But there is a strong and perhaps growing demand for mixed cotton and silk goods. *Lungi*, *súsi*, *garbhi* and other mixed silk fabrics are largely manufactured and very generally worn. Nor must it be forgotten that the use of mixed fabrics appeals to a far wider class than could indulge in the use of pure silk goods. The complaint that people prefer quantity to quality, mixtures of cheaper materials to the more lasting (but more expensive) pure fabrics, is not confined to India alone. The change is inevitable, and is a necessary accompaniment of the more general diffusion of wealth, the raising of the standard of comfort among the poorer classes of the community. We can, perhaps, afford to disregard the somewhat sentimental complaints contained in various district reports as to the decline in the use of pure silk fabrics. If the soldier of the Khálsa no longer swaggers into the fight with his turban of *daryai*, if the bride no longer sends her father to the *banya* in order that she may appear with a fitting trousseau of Bokháran silks, it is hardly a cause for regret. It is better that fifty people should be moderately comfortable than that one should be magnificent. That silk is still used, and largely used, in the Province the figures given in preceding paragraphs will prove.

LIST OF ILLUSTRATIONS.

Silk Fabrics of the Bombay Presidency.—1. Winding and Spinning Silk. 2. Doubling and Warping. 3. Part of Heddle; part of *Phani* or Comb; the Shuttle; and Weaving in an upper storey.

Silk Fabrics of the Central Provinces.—4. Woman reeling tasar cocoons; the *asari*, *chhati*, and *jantur*. 5. The laying of the Warp; the Loom. 6. Spinning Implements.

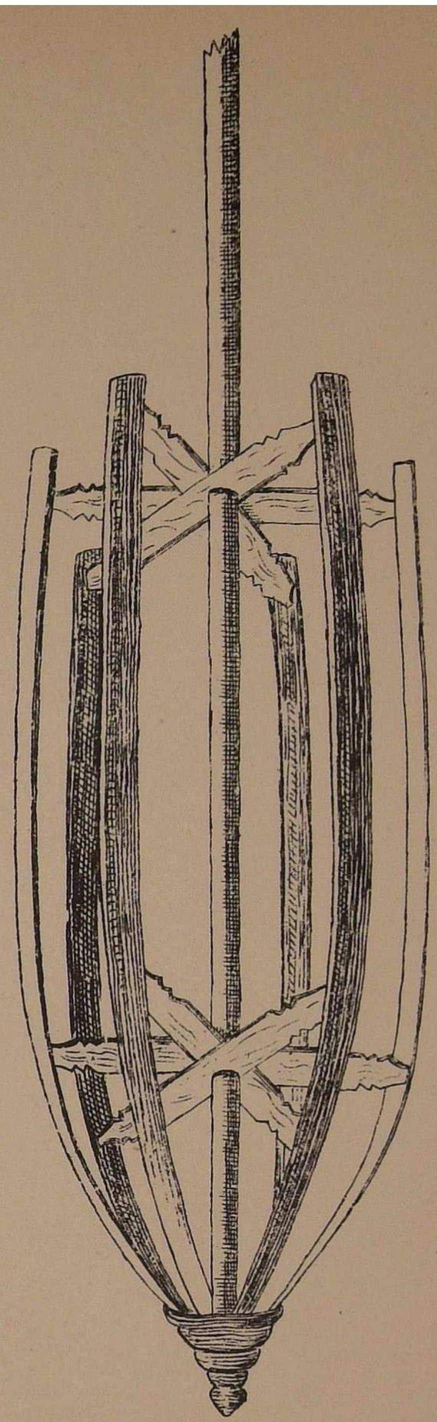
Silk Industry in the Punjab.—7. *Charkha*, &c.; the Loom. 8, 9. Spinning Implements, &c.



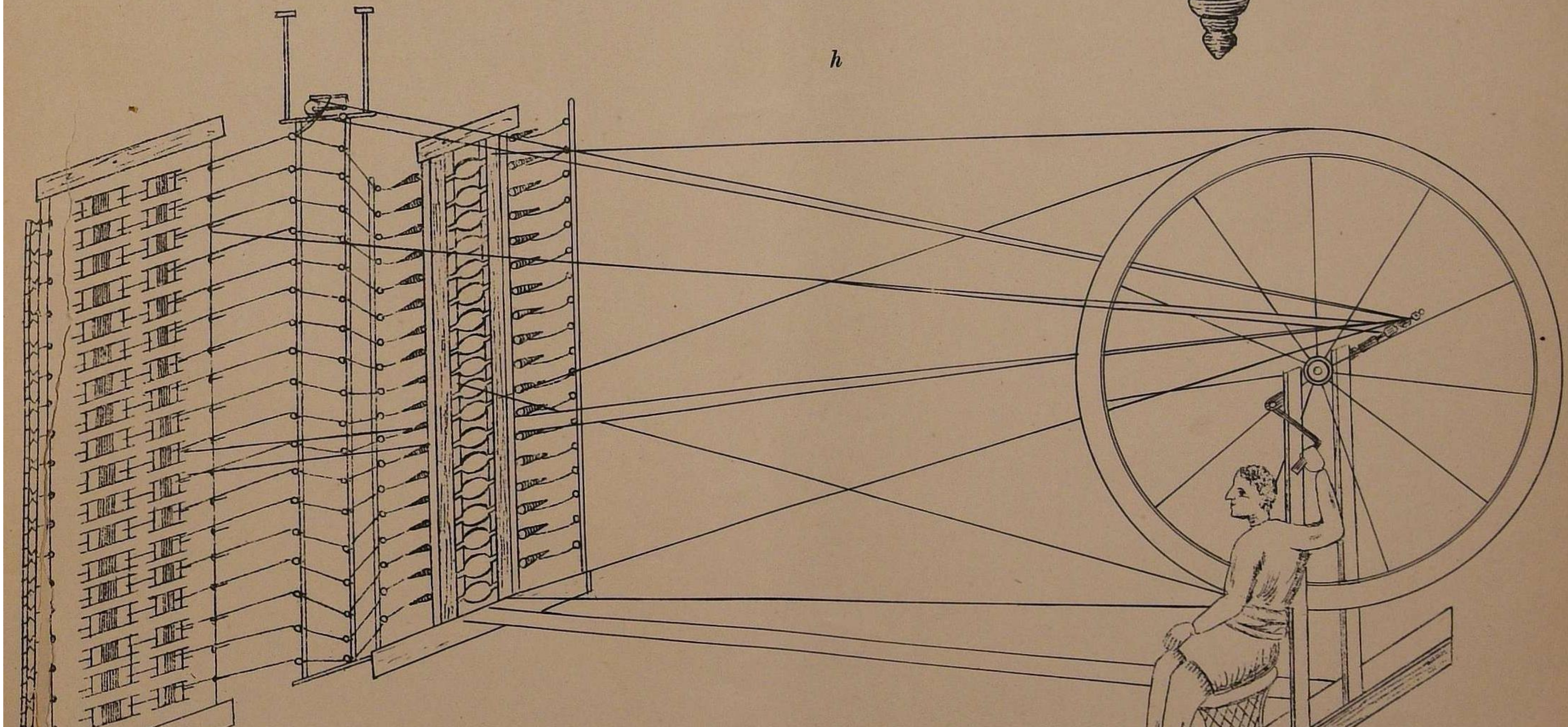
7.—*a. Charkha. b. Uri. c. Uras. d,e.* The loom.

f

g



h

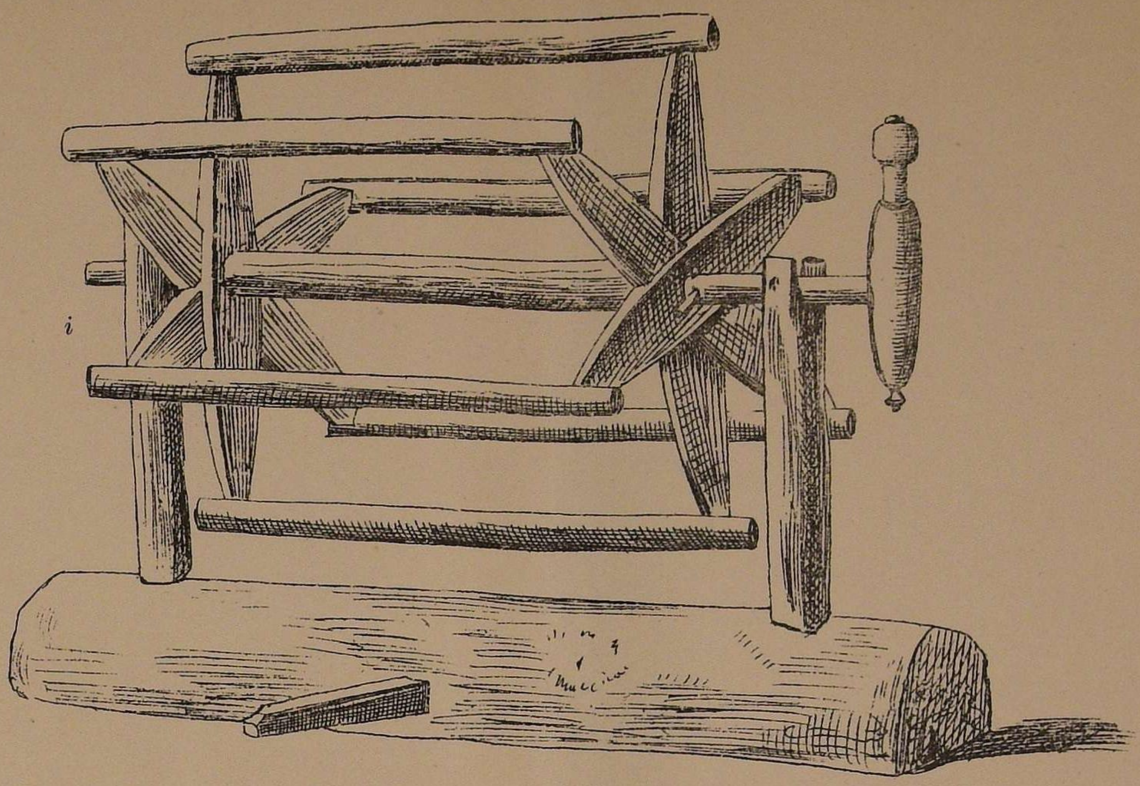


8.

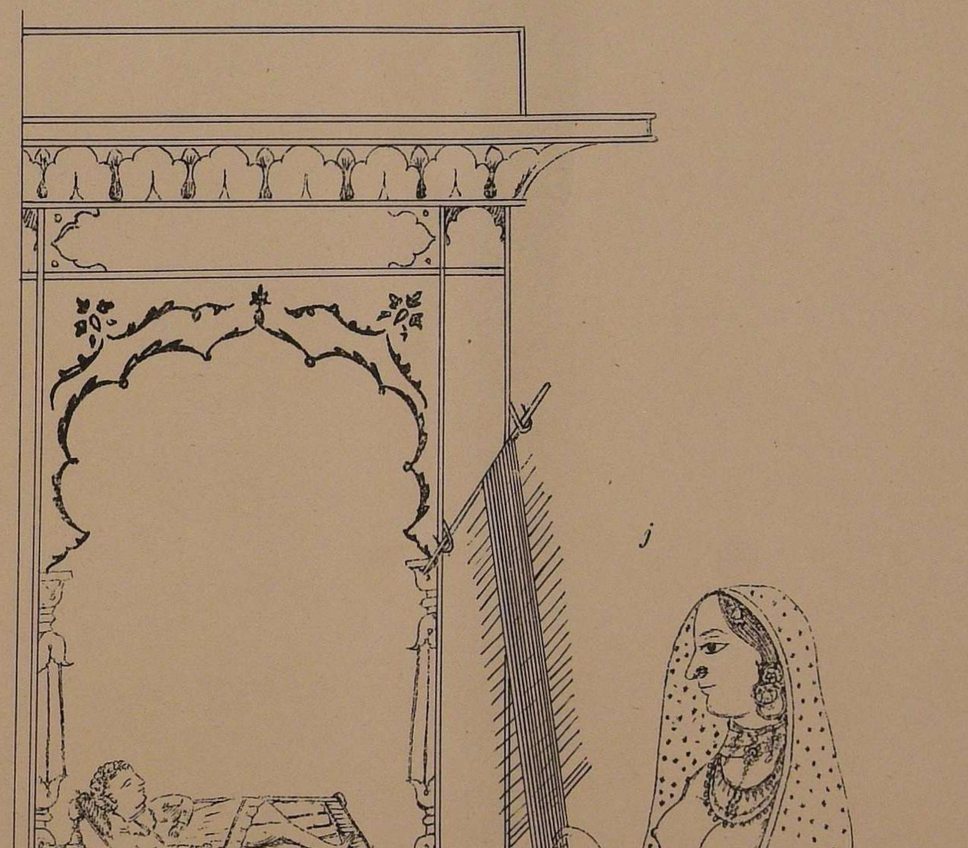
f. Salái. g. Paraitá. h. Twisting the thread.

(*Silk Industry in the Punjab*).

i



j



9.

i. Tabeel. j. Making *azárbands.*

(*Silk Industry in the Punjab*).

INDEX

TO

VOLUME V.

JOURNAL OF INDIAN ART

AND

INDUSTRY.

IVIE HAMILTON.

INDEX.

A.

Abacus, 57
Abdul Gaffer, 51
Abkhora, 39
Adári, 61
Agardan, 41
Ahamadiyans, 32
Ahmedabad, 9
Ahmednagar, 60
Akbar, 50
Alwans, 2, 3
Ambala, 46, 47
Amritsar, 36
Anatto, 5
Anjani, 43
Ankri, 47, 48
Arabesque, 50, 54
Aragu-kulishan, 34
Architecture, Dravadian, 57
 Indo-Scythic, 58
Armlets, 30, 31, 34
 grass, 29
Arais (spangles), 49
Art, Dravidian, 29
 Industries, Madras, 29
 Mirzapur, 55
Arunellikay (Phyllanthus distichus), 31
Astawa, 39
Athisttanam, 57
Atrdan (scent vase), 61
Avarakkay, 34
Awa (kiln), 38

B.

Babul (Acacia arabica), 59
Baden-Powell (B. H.), 59
Baghai, 61
Bahadurpur, 2
Bakam (Cæsalpina sappan), 5
Bakosh (Adhatodia vasica), 5
Baluchar, 2, 4
Banesh (chocolate), 5
Bangles, glass, 35, 47
Banhus, 2, 4
Banni, 36, 38
Bannu, 38
Base, 57
Bastion, Chaurasi Gumbaz, 50
Bata Krishna Ranu, 2
Batala, 45
Battak, 39
Batuas, 56
Bauvali, 32
Beads, 30, 31
 utrasum, 31
Beldanga, 2
Belt, 34
Bhadrasana (hourglass-shaped cane seat) 58
Bhatti (kiln), 38, 56
Bhora, 36
Birdwood (Sir G.), 10-1
Bisen Chand Babu, 2
Bisheshar, 55
Bombay, 60
Bookbinding, Exhibition, London, 53
 Persian and Indian, 51
Bottu, 34
Bracelets, 31, 34, 60
 grass, 29
Brackets, lion, Ramesvaram, 57
Brahma, 33
Brahmins, 32, 33, 34
British Museum, 53
Bulaku, 33
Burbura, 44
Bushanam, 58
Butedar, 3

C.

Calotropis gigantea, 30
Carpets, cotton, 55
 woollen, Ahmedabad, 10
 Mirzapur, 56
Carving, wood, Ahmedabad, 9
 stone, 50, 55
Chak, 37, 38
Chak lakri, 37
Chaku Buddhar, 7
Champa flower, 59
Chandra-purai, 32, 34
Chapni, 38
Chapra (shell lac), 45
Charkhana, 2, 4
Chati, 38, 39
Chaturi, 38
Chaukaras, 2, 4
Chauphalá (spice box), 61
Chaurasi Gumbaz, 49
Chelis, 2, 4
Chetties, 34
Chidi, 62
Chikni mitti (clay), 35
Chillams, 37, 38, 41
Chilni, 37, 38
Chirag, 41
Chiru-thali, 33
Chiswick (Mr.), 13
Chorki, 6
Chorpanis, 49
Chunar, 55
 tomb of Saint Qásim Sulaimáni, 56
Churis, 2, 4, 47, 48
Coimbatore, 30, 31
Cowper, 13, 20
Crooke (William), 55
Cutch, 60
 silver work, 59
Cuttack, 59

D.

Dahauni, 40
Damascening—
 wire on iron or steel (*koft*), 60
 gold and silver on alloy (*bidri*), 60
Danda, 37
Darpana (a mirror), 58
Dasuya, 49
Dawait, 41, 44, 45
Daylesford, 11
Delhi, 37, 43, 49
Dera Ismail Khan, 36, 45
Derajat, 35, 37, 41
Dhotis, 2, 3, 4
Diwa, 41
Domes, 50
Dora, 37
Dravidian Architectural Details, 57
Dubraj, 1, 2, 3
Du Pré (Mr.), 14
Dyeing, 56
 silk, 5

E.

Ear ornaments, 32
Embroidery, gold and silver, 4
Exhibition (London, 1851), 61

F.

Ferozepore, 38
Finger-rings, 34
Firdusi, 53
Flaxman, 27
Flower-pots, 41, 43
Francis (Philip), 15, 20
Führer (Dr.), 58

G.

Gadha, 34
Gagra, 56
Gamla (flower-pot), 41
Ganda biroza, 45, 46
Gangu, 61
Ganjam, 30
Garuda, 33, 34
Geru, 36
Ghambail, 36
Gharas, 36, 38, 39
Gilas, 39
Girtha, 33
Glass Industries, Punjab, 35, 47
Gokhrú, 59
Gopuram, 57
Grolier style, 52
Gujarat, 9
Gujranwala, 45
Gujrat, 45
Guláb-pásh (rose-water sprinkler), 61
Gulistan, The, 51, 52
Gupte (B. A.), 59
Gusur, 35

H.

Hallifax (C. J.), 35, 43
Handi, 39, 56
Hansa, 33
Hanuman, 30
Harra (myrobolan), 56
Harsingar (weeping nycthantes), 56
Hastings (Warren), 11
Hatesingh (Brothers), 10
Havell (E. B.), 29
Hawai goods (silk muslin), 2, 4, 5
Hazara, 35
Head ornaments, 33
Hendley (Lt.-Col. T. H.), 51
Hodges, 24
Hukka, 38, 41, 45, 49, 61
Husaini, 47

I.

Impey (Sir Elijah), 13, 19, 21, 25
Indian bookbinding, 51
Indo-Scythic Architecture, 58
Islampur, 2
Ivory chairs, &c. (Warren Hastings), 24

J.

Jadanagam, 33
Jadapillai, 33
Jain, auspicious marks, 58
Jaina stupa, 58
 temple, 58
Jalandhar, 37, 43, 45, 49
James (H. E. M.), 9
Jampu, 33
Jangla, 44
Jewelry, 59
 babul work, 59
 enamelled, 61
 filigree, 29, 61
 Cuttack, 59
 Madras, 29
 repoussé, 29, 30
Jeypore Museum, 53
Jhajjar, 41
Jhajjars, 37, 39
Jhand (Prosopis spicigera), 43
Jhanwala, 40
Jhar, 38
Jhari, 39
Jimiki, 32, 33
Johnson (Dr.), 27
Jors, 2, 3, 4

K.

Kal, 57, 58
Kalasa (a pot), 58
Kalbut, 47, 48
Kallar, 38
Kalpi, 49
Kalsaram, 58
Kamin, 36
Kammal, 32
Kammâlar, 33
Kanch, 43, 45, 47, 48
Kanch churis (bangles), 35
Kandi, 2
Kangra, 36, 41, 49
Kangri, 41
Kappar, 35
Kari Abdul Ghafur, 51
Rahman, 51
Salam, 51
Ahmed, 51
Karli, 9
Karnal, 36, 38, 45
Kashigars, 43
Kashmir silver work, 60
Katoras, 56
Khagra, 2
Khajuri, 59
Kharia mitti (chalk), 44
Khetu Babu, 2
Khilauna bananewale (toy-makers), 46
Khumru, 40
Khurda, 46
Kil, 62
Kipling (J. L.), 43, 44
Kistna, 34
Kodunkai, 57
Komattis, 34
Konds, 30
Konera, 37, 38, 39
Koppu, 32
Koran, The, 53
Krishna, 33, 34
Kular, 40
Kulfa, 40
Kumhar, 36, 41, 42, 44
Kum-Kuma (silvered globes), 49
Kurnapu, 32
Kuzagar, 41

L.

Lahore, 46, 49
Lajward (Lapis lazuli), 43, 44, 45
Lala Sambhunath, 56
Latai, 6
Latchmi, 34
Lawson (Sir Charles), 11
Lingam, 32
Lion, statue of, 50
List of Antiquities (Sewell), 57
Lodh (Symplocos racemosa), 5
Lota (water-pot), 39, 40, 56, 61
Lucknow, 60
fish emblem, 60

M.

MacMurdo (Capt.), 61
Madras, Art Industries, 29
Central Museum, 30
Madura, 32, 57
Maghi, 40
Mahadeo, 30
Mala, 47, 48
Malabar, 30
Mantram, 34
Maravans, 32
Martaban, 40, 44, 45
Mat, 38, 39, 40
Mathura, 58
Matichurs, 4
Matkas, 2
Matras, 2, 4
Mattiani, 36
Meerut, 49
Mekhla, 2, 3
Metal work—brass, copper and tin, 55, 56
Middlemiss (Mr.), 35
Mirgunge (Raj shahye), 2
Mirzapur, Art Industries, 55
Town Hall, 55
(Murshedabad), 2
Models of snakes, 47
Mookerji (Babu Nitya Gopal), 1
Mouldings, 57
Mrityunjay Sarkar, 2
Muhammad Sharif, 43, 45
Multan, 36, 43
Mungli, 36
Mural decoration—
glazed bricks and tiles, 43
painting, 57
Murda sang (oxide of lead), 43
Murshedabad, Silk Industries of, 1
Museum, British, 53
Jeypore, 53
Muslin, striped silk, 4
Myrabolan fruit (Phyllanthus emblica), 31

N.

Nagapatam-tandatti, 32
Nagari-jadapillai, 33
Nali (blow-pipe), 48
Nand, 40
Nandu, 61
Nata, 6
Nathu, 33
Naqash, 43
Necklace, 30, 31
marriage, 33
Nellikây, 31
Nicholls (Dr.), 13
Nombu, 34
Nose ornaments, 33

O.

Oplas, 38, 46
Ornament, almond, 34
animal, 58
aniseed, 34
babul, 59
barley, 59
brinjal, 34
bullocks, 58
centaurs, 58
chain, 50
champa flower, 59
cobra, 32, 58
coriander, 34
crocodile-gryphon, 32, 58
cypress tree, 59
date stone, 59
deer, 58
dhall, 31
dog tooth, 50
dromedaries, 58
elephant, 58
floral, 50, 54, 58, 62
garlic, 30
geese, 58
geometric, 50, 58
gokhrú, 59
grass, 30
griffin, 58
guilloche, 50
harpies, 58
horses, 58
jessamine, 31
lion, 58
lotus, 34, 58
Ornament, melon, 34
mermaid, 58
nutmeg, 34
owls, 58
parrot, 34
pear, 59
Persian, 54
pineapple, 34, 60
pipal, 59
rice, 31
strawberry, 50
trefoil, 50
vine, 58
wheat, 60
Ornaments, silver, 59

P.

Padman, 57
Painting, illustrated manuscripts, Persian, 53
Palakai, 57
Pandán (betel-leaf box), 61
Panels, 50
Panipat, 41, 45, 49
Panni, 36
Parajia, 61
Parvati, 32
Patan, 61
Patna, 60
Patri, 38
Pattabastra (pure silk), 1
Pêchari, 33
Peria-thali, 33
Persian bookbinding, 51
Peshawar, 35, 36, 37, 41, 43, 44
Phallic emblem, 32, 33
Pheran, 6
Phulikat handkerchiefs, 2, 4
Phusa, 39
Piala, 40, 45
Pilasters, 57, 58
Pillayar thali, 33
Plate, silver, Cutch, 59
Plinth, 57
Polti, 6
Poona, 60
Poth (beads), 48
Pottery—
earthenware, biscuit, 35
Jhaggar (Rohtak), 41
kaghozi, 41
glazed, 45
tiles, 43
Jail, 45
porcelain, *porcelaine-tendre*, Delhi, 43, 44
Punjab, 35, 43
rude, 35, 43
toys, 46
Purniya, 60

Q.

Qalai, 43, 48

R.

Raksha, 31
Rama, 31
Ram chak, 37
Ramesvaram, 57
Ráo Desalji II., 61
Rawalpindi, 45
Rea (A.), 57
Reiya, 2, 4
Rekhis, 2, 4
Rikabi, 40, 45
Rings, ear, 32
finger, 34
nose, 34
Royal Library, Windsor Castle, 53
Ruk, 62
Ruthrachamalai, 31

S.

Sacrificial utensils, 56, 59
Sajji (sodium carbonate), 5, 47, 49
Salvers, 61
Sanak, 40
Sanchas, 37, 56
Sandstone, 55
Sangbári-reti, 62
Sari, 1, 2, 3, 4
Sarposh, 40
Sarv, 60
Sasi Bhusan Chowdhry, 2
Sawi mitti, 36
Sculpture, Mathura School, 58
Sepi, 36, 42, 48
Sewell, *List of Antiquities*, 57
Shah Jehan Nama, 53
Shah Nama, 53
Shahpur, 39
Shams-ud-din, 44
Shanars, 33
Sheikh Basti, 41
Shingraf, 48
Shipi, 7
Shishi, 49
Shiva, 30, 31, 32, 33
Shrine base, 57
Sialkot, 45
Silk, Corah, 1, 3
Silks, Murshedabad, 1
  printed, 4
Silpa sastra, 57
Sinkh, 47, 48
Sirsa, 36
Smith (Ed. W.), 49
Snakes, models of, 47
Sonár, 61, 62
Spandrils, 50
Srinagar, 60
Srirangam, 57
St. Paul's Cathedral, 27
Statues in London of noted Anglo-Indians, 27
Sudras, 29, 30, 31, 32, 33
Sufeda (carb. of lead), 43
Sum, 62
Surahis, 35, 36, 37, 38, 39, 44, 60
Suri, 32
Surkhi, 36
Svastika (mystic cross), 58
Symplocos racemosa, 56

T.

Tabak, 40, 61
Taga, 37, 38
Tanda, 41, 45
Tandatti, 32
Taula, 40
Tawi, 40
Telugu women, 33
Thalai-saman, 33
Thali, 33, 56
Thappas, 37, 38, 48
Thar-kanuku, 32
Thathera, 56
Thatwa, 37, 38, 39
Thayittu, 34
Thuthi, 40
Tind, 40, 41, 42
Toda jewelry, 30
Toe-rings, 30
Toys, 46
Trakla, 47, 48
Treasury of Royal Pearls, 53
Triratna, 58
Tulasi-madam, 34

U.

Ulwar, 51
Ulwar and its Art Treasures, 51, 54
Umarsi Masji, 61

V.

Vases, 44
Vatká (drinking cup), 61
Vediyal, 58
Velangkay, 31
Vellálars, 33
Vethikai, 57
Vimana Sastra, 57
Vina, 34
Vishnu, 33, 34
Vizagapatam, 30, 31

W.

Warq chandi (gold leaf), 46
Weaving, silk, 5
Westminster Abbey, 28
Wood, blackwood (Dalbergia latifolia), 9
  farrash, 47
  jackwood (Artocarpus integrifolia), 5
  kikar, 47

Y.

Yali, 31, 33, 34

Z.

Zoffani, 24

ILLUSTRATIONS.

A.

Ahmedabad carving, 10
Amritsar carving, 42
Anklets, 34
Armlets, 34

B.

Base of shrine, 58
Bookbinding, Persian and Indian, 54
Bracelets, 34
Brass work, Mirzapur, 58

C.

Carving, Ahmedabad, 10
  Amritsar, 42
Chaurasi Gumbaz, Kalpi, 50
Cutch silver work, 62

D.

Daylesford Church, 10, 24, 25
  House, Worcestershire, 22
Door, carved, Amritsar, 42

E.

Ear ornaments, 34

H.

Hastings (Mrs.), 14
  Warren, birthplace of, 13
    monument in Westminster Abbey, 26
Hastings, Warren, portrait by Sir Joshua Reynolds, 18
    statue in the India Office, 26
    trial, admission ticket, 20
Head ornaments, 34

I.

Illuminated page from Warren Hastings' library, 28
Indian bookbinding, 54

J.

Jewelry, Toda, 34
  Madras, 34
Jeypore Museum, bookbindings, 54

K.

Koran, The, 54

M.

Madras jewelry, 34
Mathura, beams, 58
  copings of railings, 58
  door jamb, 58
Mirzapur, a building in, 58
  Art Industries, 58
  brass work, 58
  Library, 58
  Town Hall, 58

N.

Necklets, 34
  marriage, 34
Nose rings, 34

O.

Ornament at Sindupatti and Tiruppavagam Temples, 58
Persian bookbinding, 54
Pilaster of shrine, 58
Pottery and glass manufacture, Punjab, 42

Royal Library, Windsor Castle, bindings from, 54

S.

Shah Jehan Nama, The, 54
Shah Nama, The, 54
Silks, Murshedabad, 10
Silver work, Cutch, 62
Sindupatti Temple, ornament, 58

T.

Tiles, 42
  Afghan Boundary Commission, 50, 58
Tiruppavagam Temple, ornament, 58
Toda jewelry, 34
Toe rings, 34
Treasury of Royal Pearls, The, 54

To be Privately Printed for Subscribers at £3 : 3 : 0 net.

35 Coloured Plates, in facsimile, by W. Griggs, on hand-made paper in Demy folio, with Monograph by VISCOUNT DILLON, F.S.A.

ALBUM OF JACOBE,

Master Workman at the Armoury, Greenwich

1590.

It is proposed to publish in facsimile the above-mentioned work as a valuable record of the Armourer's art as practised in England in the second half of the sixteenth century.

The Album contains drawings in ink and colours of suits of armour made by this master for several of the most famous courtiers and soldiers of the reign of Elizabeth.

Amongst these are suits for the Dukes of Finland and Norfolk; the Earls of Leicester, Sussex, Worcester, &c.; Lord Scrope; Sir John Smith, Sir Henry Lee, Sir C. Hatton, &c.

Special interest attaches to this M.S, as it formerly belonged to the Harleian Library, and of the suits of armour therein figured some of the finest are still in existence. Of these the following may be mentioned:—Earl of Pembroke, K.G., now at Wilton; George, Earl of Cumberland, at Hothfield; Sir Christopher Hatton, purchased from the Spitzer collection for £2080; Sir Henry Lee, K.G., Master of the Armoury to Queen Elizabeth and James I., now in the hall of the Armourers' and Braziers' Company; the Earl of Worcester, in the Tower of London.

Although armour in England was, at the time referred to, fast disappearing from use, the suits shown in the work were all of a high class of workmanship and remarkable for their excellence, no less than interesting as the personal and intimate panoply of some of the brightest stars of the golden age of Elizabeth.

It is hoped that the publication of this unique MS. may lead to the identification of other suits and portions of armour still scattered through the country, and as yet not correctly connected with famous names in English history.

The reproductions will be accompanied by a short note on the MS. and brief notices of the individuals for whom the suits were made.

500 PHOTOGRAPHS OF THE ANCIENT MONUMENTS, TEMPLES, AND SCULPTURES OF INDIA.

THE SECRETARY OF STATE FOR INDIA IN COUNCIL granted permission to use the very large collection of photographic negatives of Ancient Buildings, Sculptures, &c., from all parts of India, now in the possession of the India Office. These illustrate very fully the history and development of the various styles of Indian Architecture from the earliest times, in Buddhist, Brahmanical and Jaina Caves to Dravidian, Chalukyan, Indo-Aryan, and Saracenic temples, mosques, and other buildings. They constitute an indispensable series of illustrations of the art, history and mythology of India, and are of the very highest importance and interest to Orientalists, Artists and others, in University and Art Libraries, Oriental Institutes, &c.

These Indian archæological photographs are regarded by experts who have seen them to be so important for the study of Oriental Art and History that the present work was undertaken to supply a felt want. It is to consist of three portfolios, and is published by subscription.

After the work was commenced, it was found that a large and important collection of photographs in the Imperial Museum at Calcutta was also available, but their introduction has caused delay in issuing the first part. Parts II and III will follow in rapid succession, as the plates have been very nearly all selected and printed.

Part I contains 170 plates, of which 26 illustrate the Bharhut Stûpa; 19, the Sânchi Stûpas; 6, the Sârnâth remains; and 83, the many interesting Gandhâra or Græco-Buddhist sculptures found around Peshâwar. There are, besides, illustrations of Aśoka inscriptions, Bhâjâ Cave Temples, Mathura sculptures, &c. The letterpress refers to all published sources of information respecting the different groups of remains, sculptures, &c.

Part I (170 plates) is now ready. Parts II and III are nearly ready.

LANTERN SLIDES OF THIS SERIES ARE UNDER PREPARATION FOR LECTURE PURPOSES.
PRICE £20 PER SET OF 500.

Subscribers for slides are invited to send in their names without delay, as only 25 sets are being made.

W. GRIGGS & SONS, Ld., Elm House, Hanover Street,
Peckham, London, S.E.

THE JOURNAL OF INDIAN ART AND INDUSTRY. Published Quarterly. Richly illustrated with numerous plates in colour and gold, illustrative of the Arts, Architecture, Industries and Manufactures of Hindustan. Containing Papers on Indian Gold, Silver, Copper, Brass, and other Metal Art Ware; Wood and Ivory Carving; Bidri Ware, Lacquer, Enamelling, Inlaid Work; Architecture and Architectural Decoration; Pottery and Porcelain; Embroidery, Silk and Cotton Industries; Cloth Stamping and Dyeing; Bookbinding and Decoration; &c., by Sir Edward C. Buck, LL.D.; Sir Geo. M. Birdwood, C.S.I., LL.D.; J. L. Kipling, C.I.E.; E. B. Havell; Dr. James Burgess, C.I.E.; Edmund W. Smith, Archæological Survey; B. H. Baden-Powell, C.I.E.; Mrs. Rivett-Carnac; Col. J. H. Rivett-Carnac, C.I.E.; Col. Sir S. S. Jacob, C.I.E.; Brigade Surgeon Lieut.-Col. T. H. Hendley, C.I.E.; Captain C. W. Ravenshaw; Colonel Sir R. C. Temple, C.I.E.; B. A. Gupte; T. N. Mukharji; &c. Vol. I. [parts 1—16]; Vol. II. [parts 17—24]; Vol. III. [parts 25—32]; Vol. IV. [parts 33—37]; Vol. V. [parts 38—45]; Vol. VI. [parts 46—53]; Vol. VII. [parts 54—60]; Vol. VIII. [parts 61—69]; Vol. IX. [parts 70—80].

A few copies of Vol. I. are reserved for those requiring complete sets.

CASES FOR BINDING (blocked in gold) can be supplied at 5/- each and postage.

The Journal will be sent FREE BY BOOK POST to any part of India or within the Postal Union, rolled solid, to those remitting 2/- for each part in advance, by

W. Griggs & Sons, Ld., Elm House, Hanover St., Peckham, London.

EXTRACTS FROM PRESS NOTICES.

"One of the most sumptuous specimens of colour printing ever produced is the *Journal of Indian Art and Industry* (Messrs. W. Griggs and Sons, Peckham, S.E.). It consists of facsimiles of some of the most valuable volumes in the Royal Library at Windsor Castle. Among them is the Koran. Each is reproduced with its artistic eccentricities, and the whole forms a volume of rare beauty and interest."—*Echo*, London, 4 Sept., 1893.

"The latest issue of the *Journal of Indian Art and Industry* (W. Griggs, Elm House, Hanover Street, Peckham, London) is devoted to Persian and Indian Bookbindings. The explanatory paper is written by Surgeon Lieut.-Colonel Thomas Holbein Hendley, C.I.E., who says the best specimens of bookbinding that are now made in India come from Ulwar, and are doubtless of Persian origin. There are thirteen page-plates of bindings produced with all the care for which Mr. Griggs has established his reputation. Seven of these are from "The Royal and Historical Bindings from the Royal Library, Windsor Castle"; three are from "Memorials of the Jeypore Exhibition"; and three from "Ulwar and its Art Treasures"—*English Mail.*

"Lovers of artistic bookbinding, and, indeed, art amateurs generally, have just had brought within their reach some superb illustrations of the handiwork of Persian and Indian craftsmen. No. 43 of the remarkably cheap and sumptuously-printed *Journal of Indian Art and Industry* contains no less than 13 large quarto-sized chromo-lithographic reproductions of binding and illuminations of the best Persian and Indian periods, the originals of these superb illustrations being among the most cherished examples of the Royal Library, Windsor Castle, the Jeypore Museum, and the Ulwar Art Treasures. The taste of the Persian and Indian craftsman in colour and design seems still quite unapproachable; the examples before us seem to point to ages of evolution and progressive culture to account for their consummate beauty and simplicity. Such examples of what the older civilisations have to give us should be in every art school in the kingdom. The work is printed in a luxurious style by Mr. W. Griggs, Elm House, Hanover Street, Peckham, and published under the patronage of the Indian Government. The present part is priced 2/–, an unaccountably low figure for such a repository of Oriental classicism. Had we a Grolier Club in London such work as this would create a passion among book-buyers and reform the present fashion of casing our books."—*Bayswater Chronicle*, 26 Aug., 1893.

LONDON:

W. GRIGGS & SONS. Ld., Elm House, Hanover Street, Peckham, S.E.